

MARCH 1975 75 CENTS

Popular Mechanics

8 pages: Better CAMPING in '75

■ Backpacks, tents, equipment ...

20 make-it kits that cut your costs in half

■ Lightweight gear for hikers, bikers, drivers

■ 14 RVs for leisure living

**10 simple steps to a food bonanza
from a 6 x 15 garden!**

Plus: Composting made easy

**EASY RIDERS: A dozen
powerful new touring bikes —
and a first look
at the hot
Suzuki rotary**

**CASH-SAVING
HOW-TO:**

■ Step-by-step
tune-up for your
power mower

■ Choose the right
batteries for
home use

■ Perk up your car's
ignition system

**10 smashing no-care
vacation homes — with 3
you build from stock plans**

**How to test your drinking water,
and 4 ways to purify it**



Introducing the first

You're looking at a unique-looking automobile.

It's called the Pacer.

And it looks different on the outside because it's different on the inside.

To begin with, the Pacer is wider than any other small car. So naturally, you get an unusual amount of room.

And since it's wider—and has a unique isolated suspension system—the Pacer also gives you an incredibly smooth and stable ride.

The hood of the Pacer looks the way

it does because it was designed for aerodynamic reasons. To reduce the wind resistance. So the engine doesn't have to work as hard at highway speeds. And so you wind up with better gas economy.

(The Pacer comes with AMC's proven 6-cylinder engine and a 22-gallon gas tank. Which means you get outstanding performance, excellent economy and long-distance driving range.)

With our doors we did something that borders on wizardry. We made the passenger



wide small car.

door 4 inches bigger than the driver's. So you can get in and out of the back that much easier. (We also gave the Pacer a hatchback so you can get your luggage in and out that much easier, too.)

This same ingenuity was also applied to Pacer's visibility. We wanted you to see as far as your eye can see. From our point

of view, that meant designing the car for better all-round vision. From your point of view, you'll be able to notice all the people noticing you.

A final point. The AMC Pacer, the wide small car, is covered by the wide coverage: AMC's exclusive Buyer Protection Plan.

Everything about the Pacer—the look, the room, the ride, the doors, the visibility, our Plan—make it what it really is: Everything a small car never was.

AMC  PACER



This One



E5B8-Q4J-D7K5

Charlie couldn't hammer a nail straight but now he can panel a room.

"The Whammer made me do it"

Now there really is something that makes paneling a room easy, fast and goof proof. Swingline's Whammer drives and automatically countersinks wood colored nails with a single stroke.

The colored nails become almost invisible so there's no filling needed. No mars. No dents. No scratched panels or smashed fingers. Handles molding too. Pays for itself in no grief, no mistakes and "saved" paneling. Look for it wherever you'd buy a hammer or paneling. But beware—the Whammer will make you do it.

"PERFECT FOR PANELING." *Popular Mechanics*

"AMAZING—AUTOMATICALLY COUNTERSINKS IN ONE STROKE." *Jimmy Sumlin, Bronx, N.Y.*

"NO BANGED THUMBS, FLYING NAILS, MARS OR DENTS." *James Quinlan, Morton, Pa.*

"FAST, NEVER HURTS THE WOOD." *Bob Grisham, Spokane, Wash.*



Swingline
Whammer™
2001 NAIL GUN

Div. of Swingline Inc., 32-00 Skillman Avenue, Long Island City, N.Y. 11101

The hole story.

The Rockwell 32-inch drill press starts demonstrating its flexibility when ordinary drill presses start showing their limitations.

For openers, it'll drill to the center of a 32-inch circle. Standard presses hold you to 15 inches. Or less.

For added versatility the head of the Rockwell radial swings a full 360°, giving you drilling accuracy for pieces that fit between the chuck and the floor (or low table).

By tilting the head 90°, you can handle even

larger items like the top of a door. With an ease and accuracy that simply aren't possible for lesser drill presses.

The table is an extra-big 23 $\frac{7}{8}$ inches by 15 $\frac{7}{8}$ inches. Adjustable depth stop, tilt degree scale, plus a host of other features.

Lets you perform horizontal and angular drilling, even multiple and series hole drilling.

Get the full story from your local Rockwell retailer. Most have credit terms to fit most budgets. And that's the hole story.



Rockwell International

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ON THE COVER

Camping is booming this year; these hikers are climbing in Arizona with Coleman backpacks and equipment. Photo: *Thayne Smith*

AS A SERVICE TO READERS, *Popular Mechanics* publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, *Popular Mechanics* cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.

Popular Mechanics®

MARCH 1975 • Vol. 143 No. 3

INTERNATIONAL EDITIONS: Australia, Caribbean, Mexico, Southern Hemisphere

SPECIAL FEATURES:

More camping for the money in '75. Eight-page section covering backpacks, tents, equipment, cost-saving make-it kits, new RVs starts on page 116.

Vacation homes: 10 great designs for leisure living, including prefabs, a condominium, stock plans. A way to second-home ownership. Page 67.

Grow a vegetable bonanza in a small plot. How to produce plenty of good food for your table from a plot as modest as 6 by 15 feet. Page 72.

Easy riders—the grand touring motorcycles for '75. Your rundown of the great superbikes of cycledom that range from \$2000 to \$4000. Page 82.

The shop that became a family fun center. Basement multipurpose hobby center with sliding wall panels is most popular room in the house. Page 86.

How to keep your drinking water safe. Here's how to tell if you have a water contamination problem and what to do about it. Page 108.



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A man with a full beard and mustache, wearing a tan button-down shirt and blue jeans, is looking directly at the camera. He is holding a pack of Winston cigarettes in his left hand and a single cigarette in his right hand. The background is slightly blurred, showing some foliage.

If I'm going to smoke, I'm going to do it right.

Some people smoke a brand for its image.
I don't. You can't taste image. I smoke for taste.
I smoke Winston. All Winston will ever give you
is real taste. And real pleasure. For some of us,
that's enough. Winston is for real.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

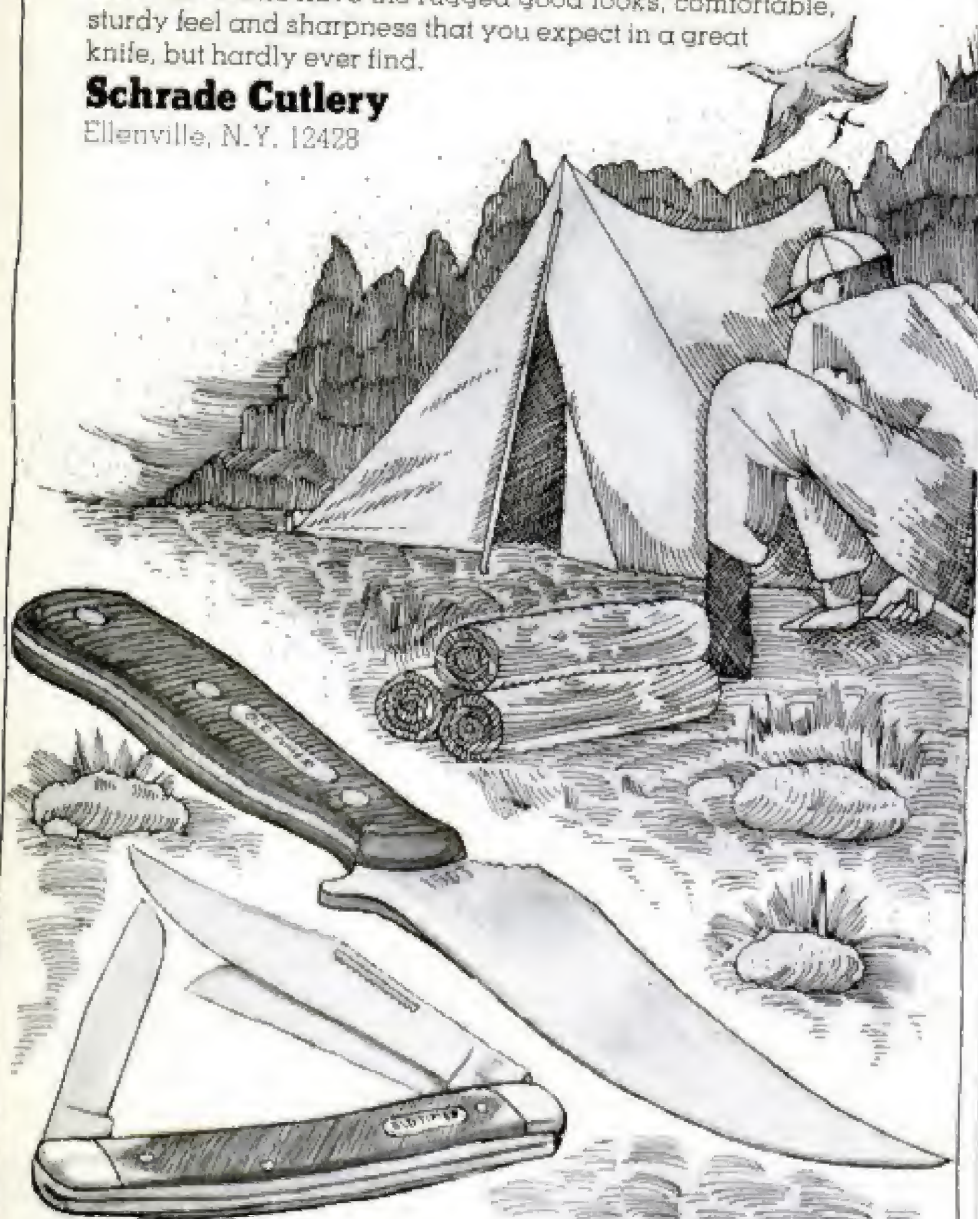
19 mg. "tar," 1.3 mg. nicotine av. per cigarette
FTC Report OCT. '74.

Old Timer knives from Schrade are built to last and last. And, like all good friends, they're dependable. They won't let you down. Every blade is of the finest, high-carbon edge-holding cutlery steel.

The Old Timers have the rugged good looks, comfortable, sturdy feel and sharpness that you expect in a great knife, but hardly ever find.

Schrade Cutlery

Ellenville, N.Y. 12428



Old Timer®

A Man's Best Friend

Popular Mechanics®

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- **RADIO CONTROLLED** from car transmitter or wall switch • **SAFETY** night and day, year 'round • **SECURITY** door locks tight when closed • **CONVENIENCE** in-car control any weather • **LIGHTING** garage lights automatically • **VERSATILE** fits all lifting type wood, metal or fiberglass doors, sectional and 1-piece • **EASY HOME INSTALLATION** in just 2-3 hours • **SAVE** up to 50% direct factory purchase and PP or UPS home delivery

• **GUARANTEED** one year • **FREE** brochure

HELMATE EQUIPMENT CO., Box 217PM, Baroda, MI 49101 (616-422-2311)



CHEVELLE.

Its standard V8 could save you \$348 in maintenance and 801 gallons of gas.

If you're looking for some clear information about what you can get in a 1975 mid-size car, this ad is written for you.

Very simply, it will tell you a few of the reasons why, in a time when new car shoppers are making extremely careful comparisons, Chevelle remains America's favorite mid-size car.

Chevelle maintenance savings.

While maintenance costs vary across the country, we used current list prices for parts, \$11 an hour for labor, and found this: If you follow the Owner's Manual for recommended service, a '75 Chevelle standard V8 using unleaded gas with the new Chevrolet Efficiency System could save you \$348 in 50,000 miles (about four years' average use) compared to its 1974 counterpart using leaded gas.

Not only less expense. Less hassle.

Anyone who doesn't enjoy taking his car in for recommended service will enjoy this:

In '74, we recommended that Chevelle owners get an oil change and chassis lubrication every 4 months or 6000 miles. Now it's every 6 months or 7500 miles.

Last year, we recommended new spark plugs every 6000 miles. Now it's 22,500 miles.

Now your Chevelle oil filter can be changed less often. And now you don't even need points or ignition condenser. Ever.

Less expense, yes. But also less hassle.

801 fewer gallons of gas to go 50,000 miles.

It's true.

The Environmental Protection Agency ran

Urban Driving Tests emphasizing stop-and-go city-type driving. We ran GM Proving Ground tests emphasizing suburban-type driving.

They show that a '75 Chevelle standard 350-2 V8 using unleaded fuel could use 801 fewer gallons of gas to go 50,000 miles than a comparable '74 Chevelle using leaded fuel.

801 gallons. Think about the difference that could make the next time you check out local gas prices.

Room you can handle nicely.

Chevelle efficiency goes beyond lower maintenance and fuel costs. So, importantly, Chevelle also offers efficiency of size.

On the one hand, it's large enough to give you room for six people.

On the other hand, it remains neatly manageable; a mid-size car both easy to drive and easy to park.

A wide, sensible choice.

Chevelle, happily, is not one of a kind. You'll find many to choose from, including coupes, sedans and wagons.

Malibu Classic (shown above) is our most distinctive Chevelle. Laguna Type S-3 is our sportiest Chevelle. And our Malibu Six is America's lowest priced mid-size car—based on Manufacturers' Suggested Retail Prices.

Chevelle. America's favorite mid-size. For all kinds of good reasons.

See them at your Chevrolet dealer's now.

CHEVROLET MAKES SENSE FOR AMERICA

Chevrolet

GRAVELY gets the best of the world's worst lawn



Instant forward-neutral-reverse. Detachable sully attachment for convertible lets you walk or ride.

with power and ruggedness that mean years of reliable performance for you.

If you think you have a problem lawn, how about this neglected Georgia mansion? To us, it looked like the world's worst lawn, a challenge to any lawn and garden tractor.

But Gravely was up to it. Knee-high grass, weeds, undergrowth, rough terrain, nothing stopped these rugged tractors and their mowing

attachments. With all-gear drive, plenty of power, and the tough construction to take a test like this in stride, imagine the years of reliable performance you can expect in everyday use.

Write for our free catalog or see your dealer and let him show you how Gravely can get the best of your lawn, garden, and snow removal chores... even if they're the world's worst!

8-speed transmission gives 800-series riding tractors right speed for any job from 1/2 mph tilling or snow blowing crawl to 8 1/2 mph let's-get-home transport speed. Positive control without fluid drive "surging" or power losses, no belts to slip or break.



GRAVELY.
A DIVISION OF CLARKE-GRAVELY CORPORATION

4303 Gravely Lane, Clemmons, N.C. 27012

LETTERS

FROM READERS

Cindy Marie is under way

Thought your readers might like to know the latest on Bill Bodisch and the *Cindy Marie* (*A Dreamboat Takes Shape in a Barnyard*, page 96, Dec. '74). The boat was successfully launched on Dec. 2, 1974, and Bill headed her down the Mississippi to



New Orleans. Before leaving, he announced that he planned visits to Miami, Panama, Venezuela, the Galapagos Islands and points west.

JOHN MCCORMICK
DUBUQUE, IOWA

Two photos of the actual launching appear on page 96.

New size: The right direction

Good luck to the editors on your new look. We'll miss your old image, but nothing is more certain than change. We all know you can't stand still; you either go backward or forward. You're headed in the right direction—forward!

LEONARD OSOWSKI
BROOKFIELD, ILL.

Your new larger format for the January issue is excellent. It seems more readable. Maybe fewer articles are "continued" somewhere in the back pages. I like that.

E.C. KNUDSON
TIGARD, ORE.

A step in the right direction—the bigger, better size for *Popular Mechanics*. Wish you'd done it sooner. I'm sure I missed many good articles with the old harder-to-handle size. Sure enjoyed the January issue.

Looking forward to your future issues.

MRS. WILSON R. WOODS
ANCHORAGE, ALASKA

I would like to go on record as being one reader who does not especially like your new trim size. The smaller size was easier to handle, store and just carry around. The new size may be a little easier to read but not to use.

ROBERT RECKENBEIL
MERION STATION, PA.

Keeping out the burglars

Congratulations to Ivan Berger, Electronics Editor, for his article on *How To Burglar-Proof Your Home* (page 97, Jan. '75).

As a reader of this great magazine for a long time, I would like to see more informative information on the subject of burglar/fire security systems that belong in every home in this country.

VERNON R. RYDER
SOUTH PORTLAND, ME.

Your article on home protection systems is the best we've read in a long time.

THOMAS A. HAEFNER
PROTECTO ALARM SALES
BIRCH RUN, MICH.

Clinic fan

I thoroughly enjoy reading *Appliance Clinic* in *Popular Mechanics* (which I have been reading for more than 50 years).

This column is one of the reasons that I have continued my reading of this magazine for such a long time—along with some other choice bits of information that I gather from other departments.

WILL A. SHAW
VENUS, TEX.

Fascinating Leonardo

A New Light on the Legendary Leonardo (page 66, Jan. '75) is fascinating. However, I would like to point out what I believe to be a discrepancy.

(Please turn to page 10)

Two more ways to be a hero in your own home!



Fix a broken window

Reach for DAP '33' Glazing Compound to replace cracked or broken window glass. It's the nation's biggest seller. Sets new panes in wood or metal sash with an airtight, watertight seal. Takes paint. Outlasts ordinary putty by years.



Reduce your heating costs

DAP Butyl-Flex® Caulk seals around doors, windows; fills siding joints where heat escapes. Helps save energy, cuts heating bills. Butyl-Flex takes tough sealing problems in stride—lasts 5 times as long as ordinary caulks.

DAP

The name people know best in home fix-up

DAP Inc., General Offices: Dayton, Ohio 45401
Subsidiary of Plough, Inc.

The best way under the sun to brighten up your pictures. The Konica Auto-S3

Finally, the flash camera that eliminates harsh, unflattering shadows that were the nemesis of outdoor photos. It's called the Konica Auto-S3, with the world's first built-in daylight-Synchro/Flash System designed in a 35mm camera.

That means, fill-in outdoor flash *without* guesswork, calculations or overexposures. Simply slip-on the Konica X20 flash, focus, line up the synchro/sun indicator and shoot. Daylight and flash combined and balanced for perfect lighting... automatically.

This pocket-size marvel is a fully automatic rangefinder 35, as well, with a fast and sharp Konica 38mm 1/1.8 lens. And loads of other pro features.

Auto-S3 is another breakthrough for Konica. And it can be your breakthrough to perfect pictures, as well.



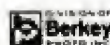
Without
Daylight/Synchro Flash.



With
Daylight/Synchro Flash.



KONICA



At your Konica dealer. Or write for literature to
Konica Camera, Woodside, N.Y. 11377. In Canada: Garlick Films Ltd., Ontario.

LETTERS

(Continued from page 9)

ancy. On page 67, top photo, you compare Leonardo's sketch with an ordinary worm and worm wheel. What I see in Leonardo's sketch is an example of "double-enveloping worm gearing" as described in the 17th edition of *Machinery*.

It seems incredible that this could have been thought of nearly 500 years ago; but Leonardo DaVinci was a genius.

STEPHEN L. HEFFNER
KEEDYSVILLE, MD.

Everybody's talking



You couldn't have given the *Newton Cradle* (page 152, June '74) a better name than *Surefire Conversation Piece*, for it sure has been a conversation piece at our house. It was fun making it and fun to watch it work.

HANK WAKEFIELD
NORTH MIAMI, FLA.

Marquetry made easy

I was pleased to read *Marquetry: A Difficult Art Made Easier* (page 88, Dec. '74). It was an excellent job of presenting the basic techniques in a concise, understandable manner.

For those interested in more information on marquetry, the Marquetry Society of America is a nonprofit organization which provides members monthly publications containing articles on all aspects of marquetry. Anyone interested in membership may contact me at R.R. 2, Salem Road, Pound Ridge, N.Y. 10576.

H. MALCOLM MORTON
PRESIDENT

Where to find cane laminate

In *Stuck With An Old House* (page 106, Jan. '75) you state: Cabinet doors are faced with Nevamar's natural cane plastic laminate. Can you tell me the name and address of the maker?

GEORGE KILDANY
ORMOND BEACH, FLA.

For the name of the nearest distributor write to: Public Relations, Nevamar Div., Exxon Chemical Co., Odenton, Md. 21113. ★ ★ ★

The no-compromise vacation. The only place you cut corners is on the cost.

We'd like to help you spend less money for your vacation this year. Without getting less vacation for your money.

So we've put together what's probably the most helpful vacation planning guide in America. It's full of facts about things you can do here. And you'll be surprised how many of them are free.

Even the Trip Kit is free. Just send us the coupon.

And find out how far your vacation dollar can take you.



Name _____ Address _____
City _____ State _____ Zip _____

Free South Carolina Trip Kit

Mail to South Carolina Division of Tourism, Room 750, Box 78, Columbia, South Carolina 29202.

"Tell me the truth, Steve. What kind of tires do I need?"



Here's Firestone Tire Engineer Steve Petrsek to answer your RV tire questions:

Q: I have a pickup camper. How do I know which tire to buy?

A: If you don't believe ads, read the articles in the RV magazines. In the Popular Science Motorcamping handbook for 1974, they talk about high flotation tires that give you an extra wide footprint and spread the camper's weight over more ground surface. Firestone strongly recommends them for pickup campers and fifth wheel campers — it's our Wide Oval System. On the front put the Firestone Transport 500 Wide Oval® for steering and stability. On the rear go the Traction All Season™ Wide Oval tires that are good on highways, great in soft stuff.

Q: What about tires for trailers?

A: Trailer tires need to carry load, and help in braking. So you can be sure you're getting what you need with Firestone's Transport® tire. You don't pay a lot for it, yet you have the capacity and load range of a truck tire.

Q: What do you recommend for motorhomes?

A: The same article tells it like it is — "Motorhomes are really trucks, and they require truck tires." So we say put on the Firestone Transport 110™ tire. Since you bought your unit for fun, not tire trouble, I think you'll like this tough, fleet-tested tire with a noise-treated tread that can handle a heavy chassis nicely.

Firestone

I love tobacco. I don't smoke.

**Walt Garrison,
football and rodeo star.**

If I'm a guy who loves tobacco,
how come I never take a puff?

Well, because I use "smoke-
less tobacco."

All it takes is a pinch of
"smokeless" in between my
cheek and gum. Feels real re-
laxin' in there. And I get full,
rich tobacco pleasure.

Another thing is, "smoke-
less tobacco" can't tie up my
hands. So I can use it no matter
what I'm doing.

If you'd like to go "smoke-
less," here's what you do. Just
look for three great brands.

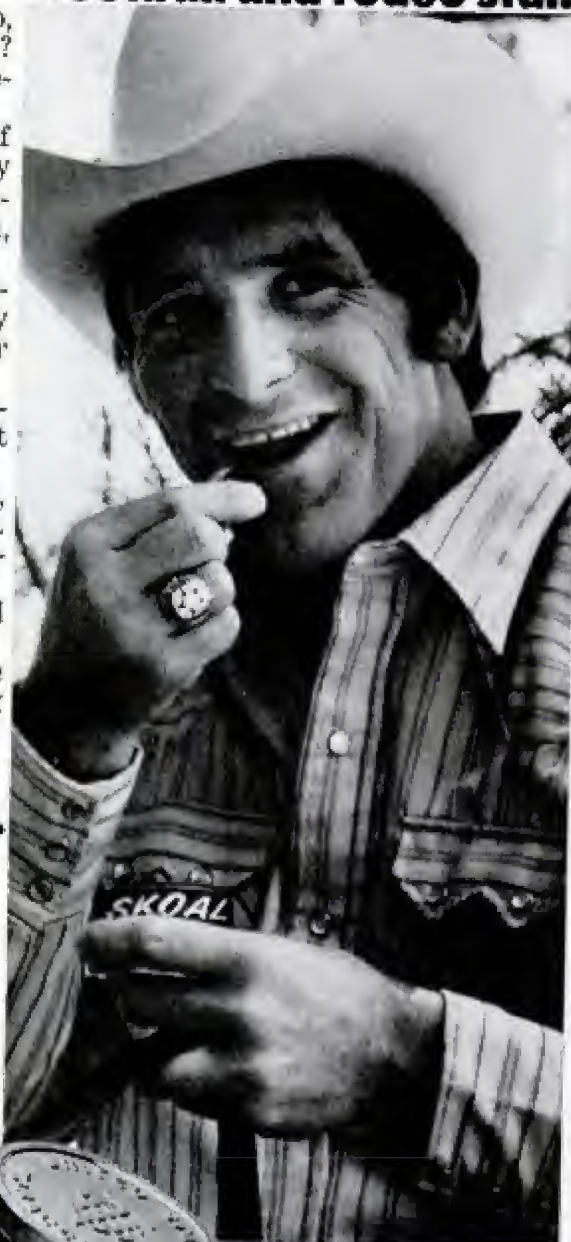
There's Skoal, my favorite,
which has a wintergreen taste.

Copenhagen, a straight to-
bacco.

And Happy Days Mint. All
three dated for freshness.

They'll each give you the
tobacco pleasure you're looking
for.

**Smokeless tobacco.
A pinch is all it takes.**



NEXT MONTH IN PM . . .

- 30 fresh ways to spruce up your home
- 20 top fishing lures
- 56 riding mowers that make sport of yard care
- Specs and best-buy tips for all the '75 car imports
- 4-channel cartridges rated
- 10 best ways to trim down and shape up for summer

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For a free booklet that explains how to get the full enjoyment of "smokeless tobacco"
—as well as a few free pinches that you can try for yourself—write to "Smokeless
Tobacco," United States Tobacco Company, Dept. P99, Greenwich, Connecticut 06830.

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THE BICYCLE SHOP

BY EUGENE A. SLOANE

Just can't get up the wind

I have never had tubular tires or Presta valves before and I am a little confused. I have the type of pump you recommend, but can't pump the tire to the recommended 90 p.s.i. Air just leaks out around the pump and valve.—John Neidigh, Bremen, Ind.

You have to unscrew Presta valves before you can pump them up. Photo shows Presta valve unscrewed, ready



to be pumped. I recommend a Silca pump, but any good Presta valve pump should get you up to 90 p.s.i. If you can't pump that pressure, at least pump enough to get to a service station, where you can screw on a Schraeder (American) valve adapter and use their pump. You can buy such an adapter from any good bike store. When using a Presta valve hand pump, be sure to knock



it off with a blow (as shown) or you can break off the valve.

Winter wonderland—with rust?

You talk about riding through snow two or three inches deep, in winter cycling. Won't this snow get your bike pretty wet and rust it out?—Bob Penzini, Scranton, Pa.

Not if you wipe off the accumulated snow, ice and assorted dirt when you are finished riding for the day. I bring my bike into the warm basement after riding in the snow. This gets the iced-up parts free of my frozen-on gunk, after which I rub the bike dry with rags, squirt a few dabs of oil on the chain and

front and rear derailleurs, and wipe the alloy cranks and chainwheel down with an oily rag. Sure, it's a bother and a hassle, but worth it just to get out and enjoy the sparkling white countryside.

Missing link

While cleaning the chain on my 10-speed bicycle I lost the chain master link. Could you advise me on how to replace it?—Bob Munson, Detroit, Mich.

You don't need a master link on derailleur bicycle chains. All you need is a rivet-removing tool (photo)



which costs about \$2.50 at any good bike store. Mount the tool as shown, force the rivet out by turning the handle clockwise. Don't push the rivet all the way out of the chain-plate; leave about 1/16 inch inside the plate. Break the chain by twisting, after removing the rivet tool. With a bit of the rivet still in one side, joining the chain is easier since the amount of rivet showing can hold the chain together while you push the rivet back in with the tool.

One-piece to three-piece crank?

I have a 10-speed with a one-piece steel crank. Can I change it to a three-piece crank?—Jeff Danz, St. Louis, Mo.

Probably. The problem is that so many of the less expensive 10-speeds with one-piece cranks aren't worth the trouble and expense of switching to three-piece cranks. One notable exception is Schwinn's Super Sport, which has a high-grade seamless steel, hand-brazed-up frame. Even for this bike the changeover would be largely cosmetic, since the weight saving is minimal. Schwinn has a conversion unit for changing any

one-piece crankset with 28 threads per inch axle threading, to a three-piece aluminum alloy cotterless crankset. This conversion unit fits only bikes with 28 threads-per-inch crank-axle threading, which includes most American-made bikes, but not CCM. This is not a metric threading, so forget European one-piece crank bikes for this conversion. Schwinn's conversion is simply a threaded crank spindle or axle which utilizes the existing old cups and locknut.

The conversion unit has a beveled shaft which should accept Shimano, Campagnolo or T.A. aluminum alloy cranks and chainwheels. Schwinn dealers charge around \$10 for the conversion spindle, but you would have to shell out about \$95 for the Campagnolo parts or about \$60 for the Shimano cranks and chainwheels.

How to warm cold feet?

Nothing seems to help keep my feet warm when I bicycle during winter months, particularly when it's below 40° outside. Any ideas?—Seymour Draper, Escanaba, Mich.

You need to use shoes that have thick soles to protect feet from pain as you press down on rat-trap pedals, shoes that are also lined with natural or man-made felt. Yet the shoes must be flexible so you can pedal comfortably. I recommend Detta Pietro "Corsa Inverno" fleece-wool-lined winter racing footwear. These are made in Italy, so if you have broad feet, with toes almost as wide as the widest part of your foot, you may have trouble with Italian shoes. Italians must have pointed feet, because they make shoes that way—at least for cyclists. You may be able to get by with lined "Hush Puppy" types, made in the United States. Get a size too large, so you can use heavy ski socks. If this makes toe clips too small, use a larger size clip or shim out the clip about 1/8 in. with a piece of aluminum stock. To protect feet from cold and keep them dry, I also like toe covers. A good pair is made by Robert L. Cartwright, P.O. Box 104, West Carrollton, Ohio. Forget electrically heated socks, they're more trouble than they're worth. ★★

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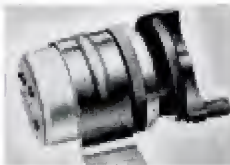
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DETROIT LISTENING POST



BY ROBERT LUND



Chevrolet Monza "S", 1975½ model with formal roofline styling, will have optional five-speed transmission later in '75.

Car prices coming down?

It's been a long, dark winter for Detroit and the car companies have been looking to March, when car sales usually pick up. But what happens if business doesn't pick up in the next few weeks? Price cuts, that's what, and they will be deep down cuts.

The auto companies say there's no way they can reduce prices because everything that goes in a car costs more and because of add-on equipment required by government regulations. No argument there. But Detroit compounds the problem by making more optional items standard equipment—the old upgrading trick. If you make the automatic transmission standard, the buyer is forced to take it if he wants that particular car.

Force feeding of accessories—some more profitable to the maker than the car itself—has added hundreds of dollars to prices. So there is a way of reducing prices. Make the luxury and convenience devices optional instead of building them into the car and price. That's the bullet Detroit will have to bite if March sales figures are not up, up and away.

Two new engines—but when?

If the government lets up on emission standards, there will be two new engines in the next two years. Chrysler will pop with its electronically controlled, lean-burn engine this fall. (See *DLP*, page 40, Jan. *PM*.) Next up, on the '77 cars, will be a stratified-charge from Ford. Chrysler will do away with some emission-control hardware, including the catalytic converter, which should let it bring out the lean burn without raising prices. But Ford's stratified-charge

engine will be more expensive to produce and command a premium price.

GM rotary put in mothballs

Wankel enthusiasts are flogging a dead horse in trying to keep GM's rotary alive. The horse could enjoy a reincarnation later on, but you won't be able to buy a GM car with a Wankel this year, and your chances next year don't look much better. The company has a crew checking the tooling purchased to build the engine to see if it can be used elsewhere. Most of it can't because the machines are one-of-a-kind built for Wankel-only purposes. GM will continue its R & D program on the engine, but as a low-key, low-budget operation.

No tears for Tucker

Francis Ford Coppola, movie director of *The Godfather*, is talking about doing a picture on Preston Tucker and the Tucker automobile. If your memory doesn't go back that far, Tucker is the guy who was going to bring out a revolutionary car in the '40s. He ran into a lot of problems, many of his own making, and the car never got off the ground. Coppola apparently thinks Tucker was a victim of a conspiracy by government and Detroit. The martyr bit.

Well, I was working Detroit as a boy reporter then and I don't think there was any plot to give Tucker a bad time. He had an imaginative car ahead of its time, at least in looks. One problem was that he was always borrowing chips to cover his bets. One of his nuttier ideas was the great suitcase caper.

Everybody wanted to be an automobile dealer in those days and Tucker signed a lot of store-front operators to sell his car. Dealers had to pay for the franchise, but that money was soon gone and Tucker had to look for a new stake. That gave birth to the suitcase idea.

You had to get on a waiting list to buy a car back then and people were coming in Tucker showrooms to sign up. Through his would-be dealers, Tucker had a proposition for would-be buyers—a line of luggage designed to fit the trunk of his car. His-

and-her suitcases, overnight bags, satchels, vanity cases, everything except a steamer trunk. If you coughed up the \$600 price, your name was put on a special waiting list and you were supposed to get delivery ahead of other customers. Some government agency didn't like the smell of that one and Tucker had to withdraw it, but not before he unloaded a lot of luggage on a lot of people.

What tipped me that Tucker's car might not make it happened at his Detroit press preview. The car was made in Chicago. A few early jobs were shipped to Detroit and auto reporters were invited out to 8 Mile Road for a ride-and-drive. I was there and the thing that sticks in my memory is that the car had no reverse gear. You couldn't back it up. How the heck could you sell a car without a reverse? To be fair, the company eventually turned out a small number of cars with reverse.

I ran into Tucker at a University of Michigan football game years after he called it quits on the car. He didn't want to talk about it. He was an interesting guy, a great promoter. But he was not a victim of any Machiavellian plot to do him in.

Pontiac to get five-speed shift

Pontiac will be the next GM division to get a five-speed manual transmission—this summer or when the '76 cars go on the line. Made by Borg-Warner, it's the unit Chevrolet will offer as an option on Monza about the time you read this. The fifth gear is overdrive. ★★★



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IMPORTS AND MOTORSPORTS



File your fright plan

When the pilot turned to his girl friend and said, "I'm Bob, fly me," she was confident enough to say yes. Bob Wills knows his business. Meanwhile, photographer Ulvis Alberts was nervously waiting and whistling a crossed-up version of *Come Along With Me, Lucille, and Bye, Bye, Miss American Pie*. As the dynamic duo took off from the ramp, Ulvis's anxiety came through as slight camera movement. But he continued panning them to a safe touchdown.

This latest form of motorcycle madness combines hang gliding and stunt jumping. The 12-foot kite is rigidly attached. Bob Wills, of Sport Kites in Santa Ana, Calif., built the special kite and has made many jumps on the kite bike. His longest so far is over 200 feet, but he looks forward to 400. It's easy to run up a 20-inch-high ramp at a casual 45 mph and glide over 100 feet. If the "sport" catches on, the kites will be marketed as a regular motorcycle accessory. Heads up!

A look at Lancia

The first Lancia to arrive in the United States was Vincenzo. His cars came later. He raced Fiats in the Vanderbilt Cup races on Long Island

back in '04, and was a wizard with motorcars when they were still a mystery to most people. He left Fiat, formed his own company in Torino, Italy, and by 1908 there was a Lancia Alfa model in America. His second model, the 1909 Beta, shown below in the new Lancia Museum in Torino, used an engine of his design—an inline Four with all cylinders cast in a single block.

Since 1909 many models have been available here. But the 1967 Fulvia was the last new Lancia sold in the United States. Meeting federal emissions and safety standards proved too costly for the small company. Since then, Fiat has taken over the firm and made the investment necessary to put Lancias back on U.S. roads. In fact,

the emissions-certified Fiat dohc, 1800-cc Four will power the 1975 Lancia Beta models that arrive here next month.

I had a chance to drive the new sedan and coupe that will carry the



old Beta name (but only caught a picture of a red coupe as it sped past a signpost!) Both models live up to Lancia's long reputation for finely crafted automobiles. The sedan will be up against tough competition from more established imports—Volvo, for example—but the coupe should have a



field day here. It's an absolutely extraordinary 2+2. There will be more on the cars, including specs, next month in PM's roundup of all 1975 imports.

The green mystery car? It's the Lancia Stratos. With it, Lancia won the 1974 World Rally Championship for Makes. No mean feat. ★ ★ ★



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APPLIANCE CLINIC

BY PAUL MANN



Seal solution

I am having a problem with the ice-maker of my GE refrigerator (Model TCF). Water is leaking from the ice-cube molds down through the vertical shaft that ejects cubes. This is causing icicles to form on the end of the ejector shaft. What do you think?—Anthony Flasek, Warren, Ohio

I think the seal that is supposed to keep water from leaking has ruptured. This is not uncommon with original seals. GE has issued a seal kit to prevent a recurrence, but I suggest you get a qualified serviceman to handle the task as it requires special tools. If the repair is not handled properly, there is danger of scoring the sides of the mold which would cause permanent damage.

I can't tell you what the charge would be—it varies with the area and problems encountered. It would

be wise to get a few estimates—over the telephone, if possible. Compare them to the cost of installing a replacement icemaker incorporating the new seal.

Suggested price of the icemaker—you can get it from a GE dealer or service center—is \$34.95. It can be installed by a competent do-it-yourselfer who closely follows instructions accompanying the icemaker. No special tools are needed.

Basket-patching

The only complaint I have with my three-year-old KitchenAid dishwasher is that the utensil basket is rusting, and rust is being transferred to the dishes. A replacement basket is very expensive (about \$35). Can this one be repaired?—Alyce M. McMullan, Placentia, Calif.

Go to a hardware store and buy a silicone-rubber sealer—GE and Dow Corning make them. Sand all rust off affected areas of the basket, even if it means going down to bare metal, and apply the sealer to these spots. If the sealer fails to hold, buy an epoxy repair kit. GE makes one for its wire dishwasher baskets, but they're also sold in hardware stores. Make sure the areas to which epoxy is applied are clean. The color of the patched spots may not match the original color of the basket, but perhaps this won't matter if you save the \$35.

Beating around

A problem I have with my old (circa 1960) Sears electric food mixer is that the beaters slip from the gear case while the mixer runs. Should

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I get rid of the unit?—Arnold B. Hawk, Hanover, N.H.

Why? Unless something quite unusual is wrong, what you need to get is a new set of beaters, since the shafts of the old ones are probably worn. See Sears.

Sentry's post

My belt sander dropped on a concrete floor, and the roller broke. The sander has Sentry Hardware Corp., U.S.A., printed on a plate, but no address. Can you locate this company for me, so I can get parts?—Paul Glicken, Pomona, N.Y.

Sure. It's Sentry Hardware Corp., 33 Public Square Building, Cleveland, Ohio 44113.

Airconditioner noises

From the first day, my relatively new Fedders 18,000-B.T.U. room airconditioner has given forth with a clunk when the compressor cuts out and has vibrated when running on HIGH COOL. The dealer tells me this is normal. Is it?—Harold B. Sherman, Montgomery, Ala.

No. It sounds as though the com-

pressor was knocked off its mount during shipment or installation. Another reason for noise can be that sections of tubing are touching and hitting against each other during operation. I suggest that the unit be slid from its sleeve, set on the floor and operated while you watch. If the compressor is off its mount, reposition it. If tubing is hitting, it can be bent apart or shimmed.

Cleaning coils

Here's a tip your readers who own Sears refrigerators may find useful. It concerns cleaning the coil behind the grill. No matter what vacuum attachment is used, you can't get to all parts of the coil behind the grill to clean it satisfactorily. I use a flexible plastic bottle with a small hole punched in the cap. Fill it with hot, soapy water. Disconnect the refrigerator and squirt the entire coil with water until clean. Water drains into the pan provided for the defrost cycle. The refrigerator will use less electricity with a clean coil.—Frank LePera, Weirton, W. Va.

Thanks for your suggestion, but this could prove messy if the coil is covered with lint that could get gum-

my when wet. For an alternate, slide the refrigerator away from the wall and go over the coil with a long-handled, soft-bristle brush, letting lint drop to the floor.

More efficiency tips

Here are several more ideas to help you reduce the bulge in your utility bill. They apply to your home's water heater—gas or electric.

1. Keep the thermostat set at 150° F. (or lower, if possible). This is hot enough for any household chore.

2. Check all hot-water faucets for leaks. Repair leaks, no matter how small.

3. Insulate hot-water pipes to reduce heat loss. Hardware and plumbing-supply stores sell effective insulating materials.

4. When it's time to buy a new water heater, match heater size to actual need—oversized units eat up gas and electricity dollars. ★ ★ ★

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N. Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

you can have it, free.



Jeep invites you to compare ours with theirs.

For your free copy, see your local Jeep dealer or write: Jeep Corporation—Dept. PM, 14250 Plymouth Rd., Detroit, Michigan 48232.

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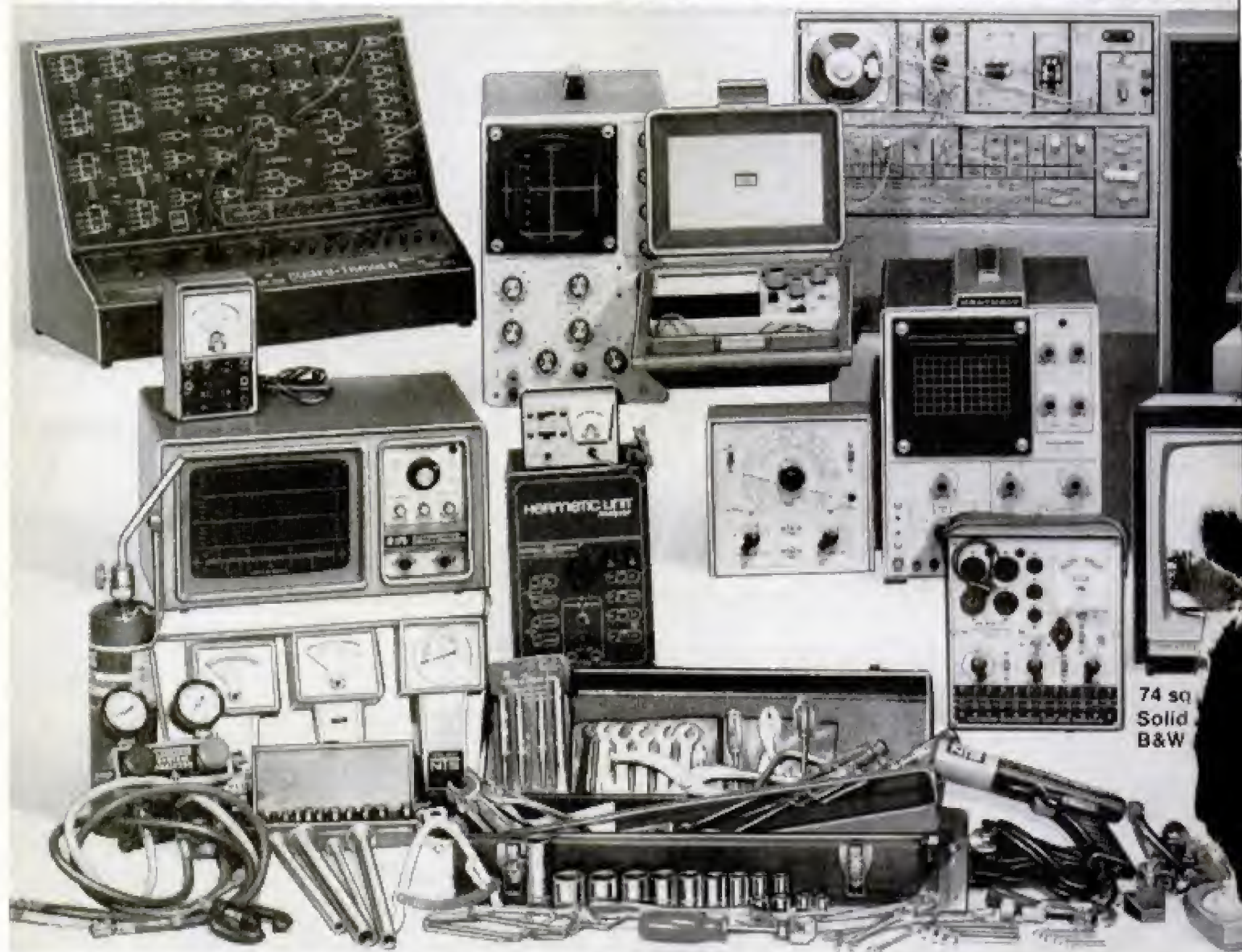
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The better the training the better you'll

Send for one of these **FREE** Illustrated



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B&W

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ELECTRONICS DIVISION: Courses include professional equipment like 5" solid-state oscilloscope, transistor and tube-tester, vector monitor scope, 74 sq. in. B&W TV, and solid-state stereo AM-FM multiplex receiver, speakers. Color TV courses feature advanced NTS/HEATH DIGITAL GR-2000 Color TV with silent varactor diode tuning; digital read-out channel selection (with optional digital clock), big 315 sq. in. screen.

MECHANICS DIVISION: Learn engine diagnostics, motor overhaul, transmissions, automotive maintenance. Courses include 9 in. solid-state automotive oscilloscope, testers, tools, mechanic's steel tool box, & more.

AIR CONDITIONING, REFRIGERATION/HEATING DIVISION: Learn servicing of commercial, industrial and residential heating and cooling equipment. Courses include hermetic unit analyzer, leak detector, charging testing-purging manifold set, tools and more.

HOME APPLIANCES DIVISION: Courses cover repair and maintenance of washers, dryers, ranges, smaller appliances. Equipment includes NTS Circuit-Trainer and professional multimeter.

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ALL OUTDOORS

Headwork

Accidents in national parks give a good indication of the hazards facing careless outdoorsmen. A recent survey shows drowning to be the most frequent cause of fatalities when a canoe or boat overturns, a youngster plays too near the water, or a good swimmer imagines a frigid lake is like a pool back home.

Then there are people who think wild animals are "cute," and those who want the parks to put guard rails on every crag and cliff after they fall. But there are also an amazing number of visitors who crack their heads on low-bridge doorways and turn ankles on uneven earthen floors of old relic buildings constructed when most pioneers were considerably shorter (though more agile) than we are today. A blow on the skull from a low beam or branch is seldom fatal but it's a painful reminder that safety habits are also important away from home.

Staying alive afloat

Swimming, treading water, floating face down with a periodic head lift for a breath using the "drown-proofing" method, wearing a life preserver—these popular methods of staying afloat are helpful in warm weather. But with water temperatures we still have across most of the country this time of year, any boatman rushing the season needs to be particularly careful.

In water 40° to 50° F., the Coast Guard points out, you can expect to pass out in less than an hour and be dead in less than three. The cause is not drowning; it's hypothermia, the abnormal lowering of the body core temperature. Vigorous swimming speeds up loss of heat and brings death more quickly. Wearing a life jacket will not save you.

Once you fall in from a deck, dock, beach or bank, you will be in serious trouble even if you can crawl back

out but have nowhere to get warm and dry. Fall through thin ice and life expectancy goes down to 45 minutes at the most in the 32.5° water. Hypothermia is unpleasant to think about; essential to avoid.

For reel

For months now we've been hoping to run into the hot-shot fishing friend who predicted so strongly a couple years ago that all fishing reels would be of the spin-type by 1975. Instead, recent sales trends indicate that bait-casting and fly rodding are stronger than ever, and that many anglers now are carrying closed and open-faced spinning reels, bait-casting and trolling reels, and fresh and saltwater fly reels. They know how to use them all, and take special pleasure in choosing the one reel that will give them the most rewarding action.

For the beginner, a closed-face spinning rig is probably the best selection, but the new bait-casting jobs that are equipped with a centrifugal brake to prevent backlash deserve a test if you haven't tried them.

On target

The best influence on American marksmanship since the invention of the rifled barrel may be the current controversy over lead versus steel shot.

A number of ducks die from lead poisoning each year when they eat

spent shotgun pellets in marshes and ponds. Laws are now beginning to ban lead shot in some areas in favor of steel. But steel has less range and may cause more crippling.

No matter what the outcome, it is a good reminder that estimation of range is part of marksmanship, and "sky-busting" at distant targets is worse than futile. Now is the time to practice on ranges and afield the special skill of estimating how far it is from here to there.

RV growing pains

For a lot of us, recreational vehicles are ideal for roomy daily transportation plus the option anytime of getting away from it all. They provide more action for the energy and fuel dollars needed, but still are not fully appreciated by people who haven't tried one. Recently, however, several town ordinances that ban parking your RV in your front driveway have been challenged and cancelled in court. That's one encouraging sign of progress.

And then there was the time this summer when we stopped at the Atlantic City branch of the "world's inn keepers" chain and an attendant insisted he had to park our van conversion, for a tip, up in their garage. He hoped (successfully) we would be many miles away in the dark before we discovered they had smashed our roof on a low beam. We won't be back, and won't forget. RV owners, unfortunately, still have a real need to take extra precautions.

(Please turn to page 32)



Inflatables are gaining popularity with outdoorsmen as multipurpose craft for everything from still fishing to running up white-water rapids of the Snake in Idaho. This 14-foot Bonair III from Bonair Boats, Lenexa, Kans., can handle a 40-hp motor.

Johnson V-4's. Where dependability runs deep.

You need big power for bigwater running. But you need dependable power and fuel efficiency, too. Both run deep through our V-4s—85, 115, 135 hp.

We've been refining the V-4 and the full 90°-V design ever since we introduced them to outboating 17 years ago. Refining to give you more fun per gallon with exhaust tuning that clears burned gases

from combustion chambers. Then packs in more of a cleaner fuel/air charge.

With our patented Pressure-Back piston rings that use combustion chamber pressure for a better seal. For less friction. More fuel economy.

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And now new Easy-Tilt shocks take half the effort out of raising our V's to full tilt position. Or choose special T'N'T models with remote control power trim and tilt.

See our V-4s at your Johnson dealer. And our other models starting at 2 hp plus four high-thrust electric outboards. Or write for free catalog. Johnson Outboards, Division Outboard Marine Corporation, Sea-Horse Drive, Waukegan, Illinois 60085, Dept. PM-35.



See your Johnson dealer's All-Family Boat Show in March

First in Dependability
Johnson
OUTBOARDS



1891. The object of a fast-moving new game is to drop a leather ball into a peach basket. Dr. James Naismith, Springfield College professor, invents a training diversion for football players which becomes a world-wide craze. Above, the first basketball team.

1891. College professor invents basketball. And Old Crow is 56 years old.



Those were
the days of
real Bourbon.
Old Crow
Kentucky Straight Bourbon.
Old Crow. In 1835, it was
the original sour mash
Bourbon. It still is.
Accept no substitutes.

**The original
sour mash Bourbon.
Aged six years.**



ALL OUTDOORS

(Continued from page 30)



Stability of canoe means staying upright; the Safety-Foil ridge in the sides of new Michi-Craft models is reported to act as both stabilizer and splash rail. The aluminum 17-footer above weighs 79 pounds.



Badly tied knots can reduce strength of your fishing line by 30 percent. Knotmaster claims to tie strong knots properly in monofilament, Dacron, silk or wire. \$3 from Knotmaster Industries, San Diego.



Knots that equal nautical miles per hour are measured precisely while "efficiency meter" shows change in performance for racing sailboat skipper using new Midas System from Ray Jefferson. Set is \$295.

You can time speed on measured course with red sweep hand of new OMC Parts & Accessories boat clock that matches speedometer, tack from Johnson and Evinrude dealers.



Inflatable called Sears White Water Canoe is a new 10-footer said to have good directional stability when paddled. Splash guards act as fore-and-aft decking. Boat comes in 31x50-inch bag; \$180 from Sears.

(Please turn to page 34)

BEFORE YOU BUY A STERN DRIVE, TEST DRIVE THIS AD!

Ideally, you should test drive the boat you've chosen with an OMC Stern Drive, and MerCruiser or Volvo.

But, let's face it, such a test isn't easy to arrange. That's unfortunate (for you!) because OMC's superior combination of performance features really show up in an actual comparison.

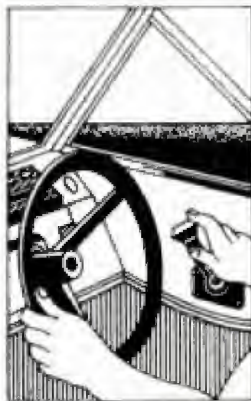
So, compare OMC with the others right on this page. It's the next best thing to actually driving the boats.

Tru-Course Steering

This will spoil you. Engineers call OMC's optional

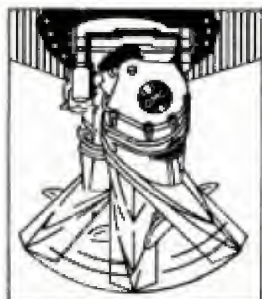
Tru-Course Steering "a non-reversing system that isolates steering loads from the wheel." In other words—when you turn the wheel, the wheel doesn't fight back. You don't have to wrestle it to hold course

or while trimming. In fact, you can take your hands off the wheel in a turn or straight ahead—at trolling speeds, or at any speed.



Better Maneuvering

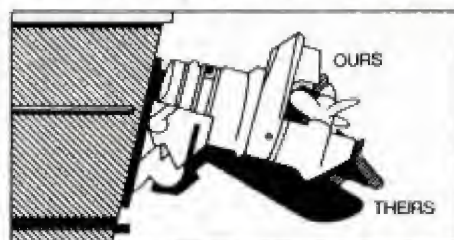
You're in for a surprise the first time you put an OMC into a tight maneuver. Because the OMC outdrive swings 90°... 50% more than the others! In fact, an OMC powered boat can literally turn inside the other two. Just look at the diagram at the right. Isn't that the extra margin you want for maneuvering into a tight slip?



In verified tests with 21' boats—at identical speeds—OMC turned in 16'1", MerCruiser in 34'10" and Volvo in 38'8".

The 75° Hi-Tilt

Only the OMC outdrive tilts up 75°—that's 25% higher than the MerCruiser or Volvo! A big advantage everytime you launch your boat from a trailer, beach it, or want to



change a prop without getting into the water, or hauling the boat out of the water.

The Uni-Mount Difference

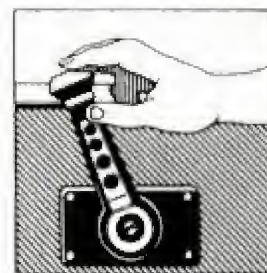
If you put your hand on the transom of the boat with an OMC Stern Drive and then do the same with MerCruiser or Volvo, you'll notice how much more the others vibrate. You can feel and hear the difference. That's because the others bolt the outdrive directly to the transom.

But OMC uses the Uni-Mount system. The outdrive and engine are an

integral unit, cushion mounted to the hull stringers. The outdrive doesn't touch any part of the transom. That's how we dampen gear train and propeller vibration and noise.

Exclusive Power Shift

When you shift the other stern drives, you do it with muscle. When you shift ours, you do it with power. Just move the control as smoothly and easily as the automatic shift lever in



your automobile. And it takes only a 22° movement of OMC's shift lever to go into forward or reverse. The others take 40° to 45°—which

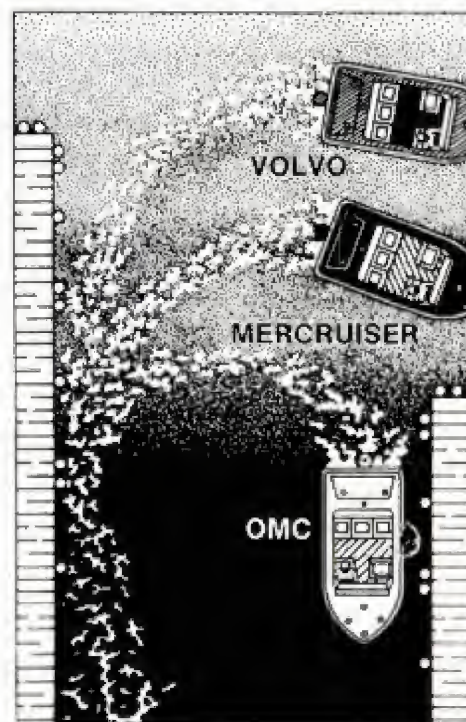
means slower response.

Check The OMC Test Charts

Want even more proof? Ask your dealer to show you the carefully documented OMC V-8 speed and fuel consumption tests.* Check OMC's winning V-8 fuel economy compared to competitors' engines of similar horsepower.

Now you're ready to buy your boat, with an OMC Stern Drive. There are fourteen models to choose from, including five top-performing V-8's.

*Verified by independent marine test laboratory.



FROM THE MAKERS OF
JOHNSON & EVINRUDE

OMC
Stern Drive

A DIVISION OF OUTBOARD MARINE CORPORATION
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(learn to fix appliances yourself)



With today's delays and today's prices, you can come out way ahead by fixing your own appliances. Not just a fuse or a switch, but almost anything that goes wrong with almost all your appliances. That includes your refrigerator, washing machine, and power mower, as well as your toaster, mixer, and vacuum cleaner.

It's really not as hard as it looks, once you know how things work, where to get parts, and a few tricks of the trade. And that's what NRI home training in servicing electrical appliances is all about.

It's far more than a reference book. It's a complete, 45-lesson program prepared by experts in home study to give you the know-how and skills you'll need. Easy-to-digest, bite-size lessons let you proceed at your own pace, and an experienced instructor is on tap to back you up with comments and advice. You also build a professional appliance tester, included at no extra charge as part of your training.

When you graduate, you're not only able to take care of your own appliances, but can

make extra money in your spare time repairing them for your friends and neighbors. Your instruction even includes advice on how to set up your own business, if you've a mind to.

Send today for our free catalog which describes the NRI electrical appliance repair course in detail, including a complete resume of lessons. There's absolutely no obligation and no salesman will call. Invest a postage stamp and see the money you can save... or make... with these easy-to-learn skills.

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ALL OUTDOORS

(Continued from page 32)

Protection for the outdoorsman using trailered camping or travel rig, boat or snowmobile, can be provided with a \$6 Hitch-Lock that secures a trailer's hitch on or off car.



Van and panel-truck conversions and styled customizing by owner are easier with new roof scoop, paneling, bucket seats, dinette/bed/bench, shag rug, port-holes and other extras in Sears RV catalog.



Proper load determination for International light-duty trucks can be had by writing to International Harvester's Chicago headquarters. Dealer gives free gross-vehicle-weight check.



Propane-powered camping equipment, easy and convenient to use, is now available in numerous new models. Sears has two-burner stove, \$35; 11-pound refillable cylinder, \$22; double-mantle lantern, \$20.

(Please turn to page 36)

Just like Dad's...

The wholesome and unforgettable experience of working on a **FIRST** project with Dad.

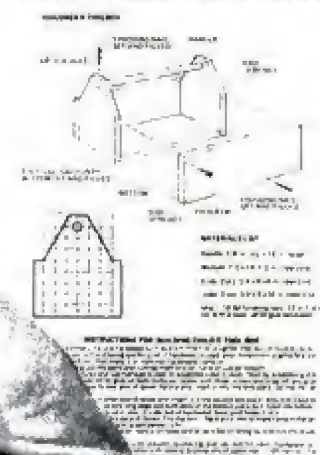
The editors of Popular Mechanics have put together a delightful educational combination—a child's first workshop project and a father-son, look-alike workshop outfit.

The project is designed to demonstrate the relationship of plans, tools and labor with a useful finished product.

A surefire way to let him experience the solid fulfillment of creating with his hands while, at the same time, getting a little closer and identifying with his father.



Popular Mechanics Child's Tool Box



HERE'S THE PACKAGE —

1. **Popular Mechanics carpenter apron for Dad.**
Official PM apron of rugged blue denim. Bright yellow imprint. Three full depth nail pockets. Rule pocket **\$2.95 plus 35¢ shipping**
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Accurately scaled copy of full size model. Same imprint, material, details *plus* an adjustable neck strap **\$2.95 plus 35¢ shipping**
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Especially designed for this program. Simple enough for him to follow (with your help). Step-by-step instructions and specs for constructing a sturdy tool box that he'll use for years to come **\$1.00 plus 15¢ shipping**

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When Jack Nicklaus makes a great golf shot, that shot is the result of careful study and the right choice of club for the job. Making the right choice for any job can make the difference . . . yards of difference.

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Look for the Jack Nicklaus tag on the full line of Murray Mowers at your dealer's, or write
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ALL OUTDOORS

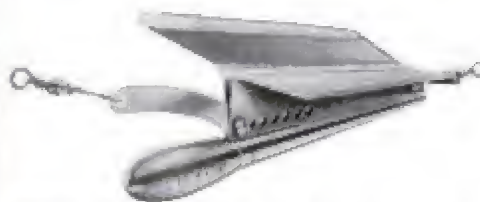
(Continued from page 34)



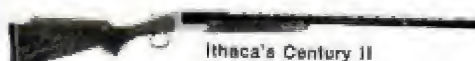
Protection from scrapes on court when returning low shots is afforded by \$2.25 Racquet Guard from Future Products, Box 455, Lindenhurst, N.Y. Light weight and no vibration are reported for the guard.



Free spool action for longer casts of lighter lures is claimed for Heddon's new Mark 3200. Gear train and even level-wind mechanisms are disengaged for casts; centrifugal brake system stops backlash.



Preset trolling depth is feature of the Gladding-South Bend Luxon Magill Planer in stainless steel. Planer assumes surfacing position when fish is hooked; is reported to have caught fish at 430 feet.



Ithaca's Century II



Florentine ornamental handgun

Single-barrel 12-gauge fully-choked trap gun from Ithaca Guns, the handsome new Century II, is available in 32 or 34-inch barrel, straight or Monte Carlo stock with silver scroll etching, gold trigger: \$599.

Flintlock holster pistol is a Florentine ornamental handgun in .52 cal., made in Belgium and fully functional. Decorated smooth-bore-barrel model, 21 inches long, is \$210. Dixie Guns, Union City, Tenn.

Compare TV/Audio home training and you'll choose NRI.



Compare costs

Only NRI offers five complete TV/Audio Servicing Courses from \$312 to \$1095 . . . with easy budget terms also available. In the Master Course in color TV servicing, with its 25" diagonal solid-state color TV kit designed specifically for training, you save as much as \$650 under a comparable course from the next leading home study school.

NRI saves you money because we pay no salesmen, and we design our own kits and equipment. We pass that savings on to you.

Compare choices

NRI has five levels of TV/Audio training to match your specific needs. The basic course offers 65 lessons, including color TV training. Or you can step up to a more advanced course including a 12"

diagonal B&W TV training kit. Then there's the 19" diagonal solid-state color TV training kit; the advanced color TV course for technicians—with an 18" diagonal color TV for experiments and troubleshooting; and finally, the new 25" diagonal solid-state color TV course—engineered specifically for training. Training Kits for this course include an oscilloscope, TV Pattern generator, and digital multimeter.

Compare training

NRI maintains its own full-time staff of technical writers, editors, illustrators, development engineers and publications experts. The people who design the kits also design the lessons, so theory and practice go hand in hand. Along with each course, NRI provides bite-size, fully illustrated lessons; personally-graded tests; and the kind of person-to-person teaching that makes learning easier and faster.

More than one million students have enrolled with NRI. NRI graduates will tell you: you can pay more, but you can't buy better training.

Compare equipment

Don't just count kits. Count the experiments . . . compare the components. NRI has engineered the widest variety of electronic lab equipment ever designed for training at home. When you enroll in the Master Course in TV/Audio Servicing, you receive kits to build a solid-state, triggered sweep, service type 5" oscilloscope; color pattern generator; solid-state radio trainer; and 3½ digit digital multimeter.

Send for the free NRI full-color electronics catalog. You'll find courses offered in TV/Audio Servicing, FCC License, Complete Communications Electronics, Marine and Aircraft Electronics, Mobile Communications, etc.

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PHOTO HINTS

FROM READERS

Pinking shears cut dodgers

Shadow details that might get lost in the black areas of your prints can be saved by holding back part of the enlarging exposure with cardboard dodgers that have been cut to match the shadows' shapes, and glued to thin, stiff wire handles. The dodged areas will blend in better with their surroundings if the dodgers have indistinct edges, cut with pinking shears.

—Ken Patterson, Regina, Sask.



Recycle used SX-70 film packs

Polaroid's SX-70 film packs are still useful even after you've used up the film. The pack shell is the perfect size to frame one of your SX-70 pictures (above, right). Just snap out the larger end of the pack (saving the yellow tab), remove the pack's innards (saving the battery), and reinstall the flat spring to hold a print. Older Polaroid prints will also fit. Tape shut the end you opened. Now you can use the yellow tab to hold a paper-clip desk stand, or hook a paper clip through the two

battery contact holes, to hang the frame.

The batteries still have about 9/10 of their useful life left in them, too. You can wire one to the battery case of any 6-volt calculator or other 6-volt portable device. For 12 volts, you can wire two SX-70 batteries in series; for high current drains, wire several in parallel. Connections are soldered to the battery contacts, whose polarity is indicated in the photos.

—Rona Lee Okun, Harrisburg, Pa.



The little one catches the big one.

While it takes up very little space, the little Pocket 40 takes a lot of great big (3½" x 4½") pictures.

This little Pocket can take stop-action pictures in bright sunlight, because of its 1/225-second electronic shutter. That shut-

ter, together with the CdS electric eye, gives you highly accurate automatic exposure control. And a sharp 3-element lens focuses down to 3 feet for close-ups.

The Pocket 40 is yours for less than \$73. Other Pockets start at less than \$25.

Prices are subject to change without notice.

Kodak pocket Instamatic® cameras.



No 1975 pickup in America, big or little, gets gas mileage as good as Datsun's Li'l Hustler. **31 MPG.***

Li'l Hustler keeps on saving with the added response and dependability

of a new, more powerful 2000cc single overhead cam engine.

Then, too, there's a silky-smooth all-synchro 4-speed stick shift (3-speed automatic, optional). Durable steel disc wheels, 4.5-in.

rims, 6.00-14 heavy duty whitewall truck tires. A

rugged welded lattice frame, torsion bar front suspension, heavy duty leaves and double acting shocks in back. Interior comforts include a deep-padded contoured bench seat, Datsun's flow-through fresh air system or optional air conditioning, glove box, and a practical under-dash package tray, as well. So, no matter how you figure—economy, dependability, overall value—you'll be hard-pressed to outsave the 1975 Datsun Li'l Hustler.



(*1975 EPA Highway Results, Manual Transmission, all states except California)

Datsun Saves

America's #1 Selling Small Pickup.

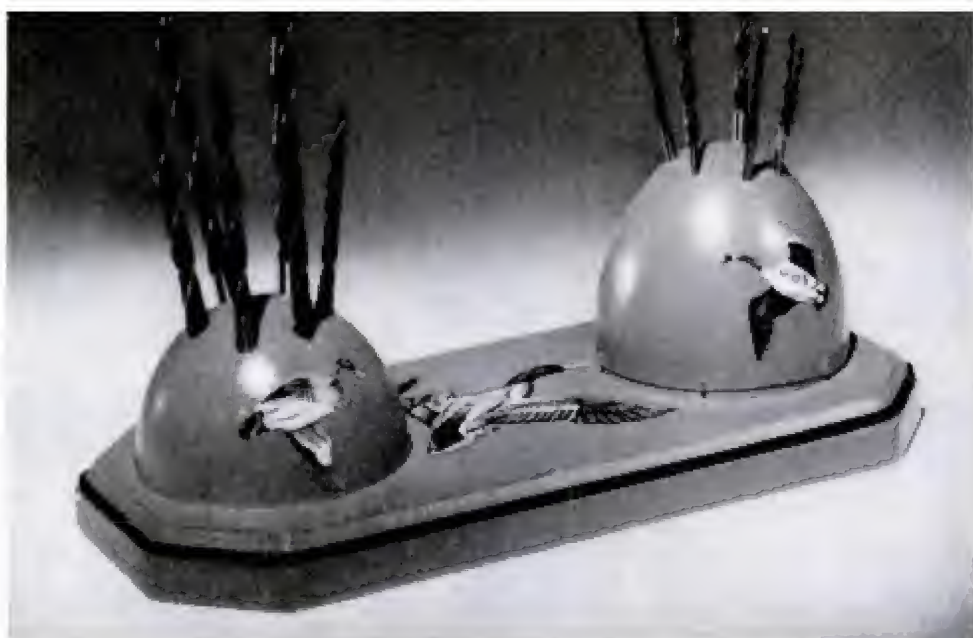
Hold everything

Something different in holders—one for your shop, the other for your study

This novel drill holder is fancy enough to use most anywhere to corral many things other than just drills. If you are familiar with the egg-shaped plastic containers in which L'egg panty hose are packaged, you'll be quick to see that the ready-made dome shapes do the holding. As the two photos show at the right, you first drill a circle of holes in the top of each half shell, using each individual bit to drill its own hole, and drilling from the inside out. Then you cut a 2-in. Styrofoam ball in half, glue the pieces inside the half shells and finally cement the shells to a suitable wood base. Each drill bit is poked into the Styrofoam through the holes in the top of the shell.

Equally as eye-catching and handy as a desk accessory is the pen and pencil holder shown below. The twin cylinders are turned and grooved two at a time on a lathe from aluminum to represent revolver chambers, then bored from the top to accept pencils and ballpoint pens.

Start with a $\frac{3}{16}$ -in. drill bit to drill the seven holes from top to bottom, then redrill to final size with a larger bit for a depth of $1\frac{1}{2}$ in. Drill a couple of holes at a time, take a cof-



Line shell with masking tape to keep drill bit from wandering. Drill holes from inside.



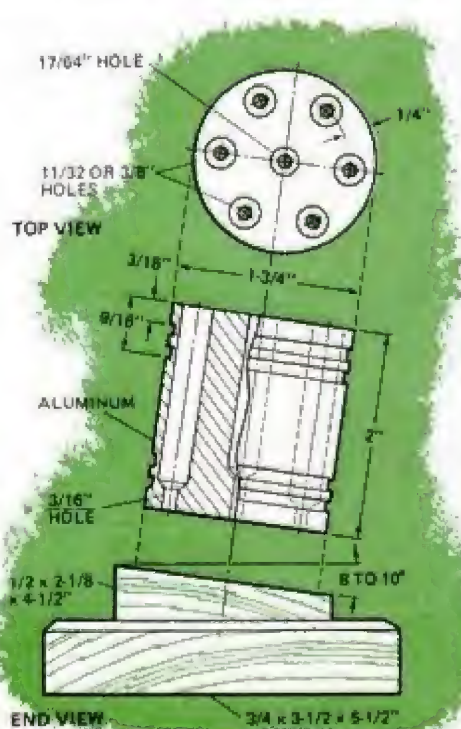
Cut Styrofoam balls in half, glue inside shells. Drills are poked into foam from top.

fee break to allow the metal to cool to avoid overheating, then continue. One cylinder should be drilled to hold slender pens, the other to take fatter ones.

After polishing with fine abrasive cloth and chamfering the holes a wee bit to remove burrs, attach each cyl-

inder to a two-piece prefinished walnut base with a single wood screw down through the center hole.

By cutting the wood base longer, you can make the holder even more useful with a well between the cylinders to hold paper clips, stamps, or a rack to hold letters. ★★★



Pad vise jaws with leather when drilling holes. Start with small bit, switch to larger.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.



Longer...
yet
milder



Pall Mall Gold 100's

19 mg. "tar", 1.4 mg. nicotine av. per cigarette, FTC Report Oct. '74.

MARCH 1975

43

A cordless electric screwdriver

Though electric screwdrivers have been around awhile, Disston's cordless version, a year in the marketing, is a relatively new tool. An immediate—and obvious—advantage is that you are able to drive screws with power when there is none—on a job site or project where electricity has not yet been run in.

Having tried it personally, I can report firsthand that it is a tool many home handymen would like to have in their toolboxes. Under a full charge, the self-contained batteries store enough power to drive 80 1-in. screws. Obviously, that's ample for most home and shop projects.

I found that the bit turns rather slowly with a tendency to jump out of the screw's slot. Thus, when working with fine woods, it's a good idea to make the last few turns with a hand screwdriver to avoid marring the wood.

The driver operates with touch control; with the switch in either forward or reverse, the bit isn't actuated until you apply pressure to the working end of the tool. The housing is of tough plastic and the unit comes with charger, two drills and four driver bits.—Harry Wicks, Workshop Editor

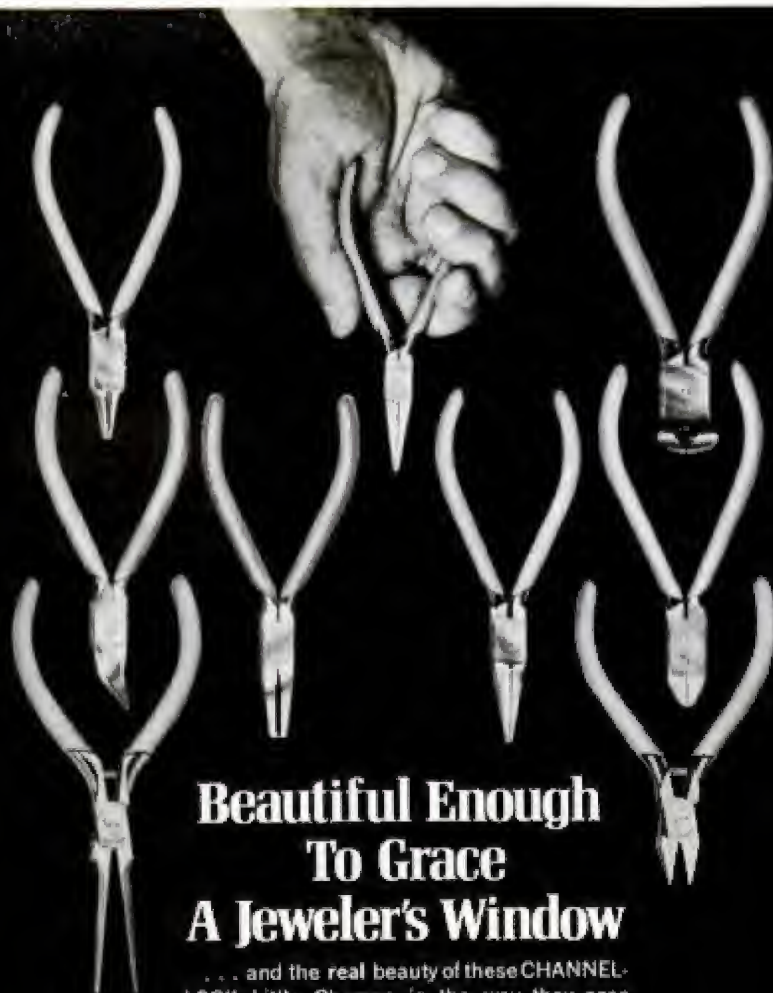


Screwdriver is powered by self-contained batteries. Recharger comes with the tool; a full charge takes about 16 hours.

SPECIFICATIONS

Model 5-100 Cordless Screwdriver

Weight (including battery): 28 oz.
Switch positions: forward, reverse, off
Batteries: nickel cadmium
Charger: use with 110-v., 60-cycle a.c.
Price: \$29.99
Manufacturer: Sales Dept., Disston Inc., 601 Grant St., Pittsburgh, Pa. 15219.



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CHANNELLOCK, INC., Meadville, Pa. 16335

CHAN NEL LOCK

Little Champ Precision Pliers

CLOCK KITS

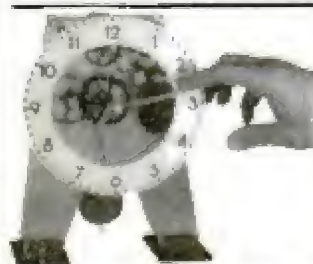
15th CENTURY CLOCK (at right) Plastic working replica of the earliest known mechanical clocks. Weight powered with nails inside plastic weights. Interesting to see how old wooden clocks worked.\$8 Postpaid
MANTLE CLOCK (not shown)—Spring powered version of above clock that will sit on a shelf or mantle ...\$8.
COLOR CLOCK—See through modern style clock that is a special delight for kids age 1 to nine.\$6.

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Castrol Expertise in Lubrication

Remember when car owners drove their automobiles into early retirement? And it was customary for loan payment books to outlast the cars?

Times have changed!

So has thinking. Once, tough, protective lubrication was considered a special benefit. Reserved for record setters, competition drivers, vintage car collectors and sportscar owners. But today, the quality motor oil that was once one man's special benefit is now every man's necessity. Because it's more economical to buy a quality oil. For the bigger share of a century, fine quality lubrication has been Castrol's special field. Our research has helped develop many tough, protective motor oils, improving their performance through run up and breakout tests in the actual engines that will use them. We demand cleaner performance, more effective protection and hard working toughness from every Castrol oil. Starting with naked molecules—if need be—to achieve the exact product quality we demand. Castrol GTX motor oil evolved from our expertise.

Castrol GTX is our finest, all-season multigrade motor oil. It offers outstanding performance and protection for all makes and sizes of cars. In these times, every car owner should demand hard working Castrol. For cleaner, smoother operation and longer engine life. Next time, buy Castrol quality . . . try our expertise.

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Castrol GTX Motor Oil



Castrol 2-Stroke
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Castrol 4-Stroke
Motorcycle Oil



Castrol GT LMA
Brake Fluid



Castrol GP
Racing Motor Oil

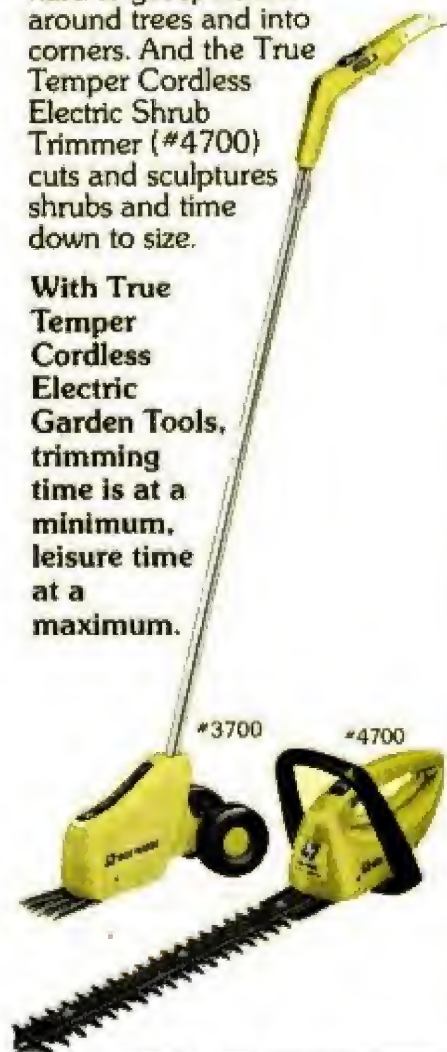




Trim Time...

True Temper Cordless Electric Garden Tools put trimming work in its place: Out of the way! For example, the heavy duty Upright Cordless Electric Garden Shear (#3700) lets you walk through trimming jobs instead of crawling the length of your driveway on your hands and knees. The Heavy Duty Cordless Electric Garden Shear (#2720) makes quick work of hard to get spots like around trees and into corners. And the True Temper Cordless Electric Shrub Trimmer (#4700) cuts and sculpts shrubs and time down to size.

With True Temper Cordless Electric Garden Tools, trimming time is at a minimum, leisure time at a maximum.



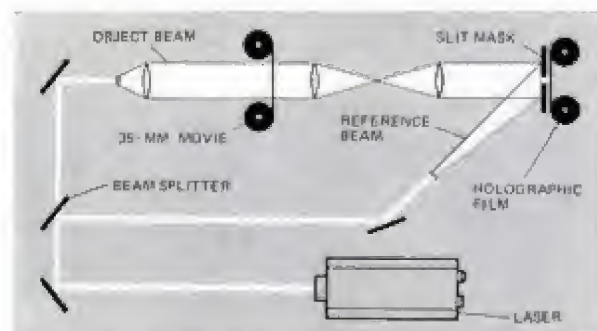
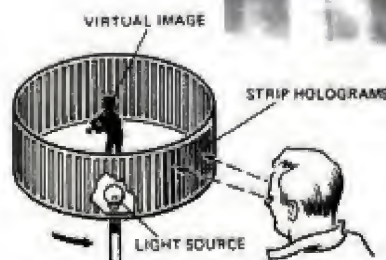
TRUE TEMPER
An Allegheny Ludlum Industries Company

Holographic movies viewed with white light

by Stephen Walton



3-D image of subject appears in center of drum-shaped multiplex hologram. Series shows motion of turntable used in original filming.



Each frame of movie of subject on turntable—for parallax between frames—is made into a strip hologram as shown schematically above. Viewer's two eyes see differently angled images—producing stereo effect.

The image you see is three-dimensional, contained within a plastic drum. It looks solid, but glows with its own light. As you watch, it both moves and revolves so that you see it from all angles.

What you're watching is a multiplex holographic movie, made by a process that requires no laser in the original filming of the subject or in playback. What you see is not a series of holograms of the subject—it's a holographic reconstruction of a 35-mm black-and-white movie shot with the subject on a turntable that makes one revolution in 45 seconds. With a laser, a white-light, image-plane hologram 9 inches high and just 3 mm (0.118 inch) wide is made of each frame of the movie. The film with these holograms is bent into a cylinder and the cylinder revolved (45 seconds per revolution) while illuminated from within and below. Each of the viewer's eyes sees the images produced by several of the strip holograms, but the two eyes see different sets, and the result is a moving stereoscopic image.

Holographic movies that are sequences of original holograms are also made, but are costly, and object-size limitations have so far restricted their use to microscopy. The new process was developed by Lloyd Cross and Dave Schmidt of the Multiplex Co. Their first holograms of this type, along with the one shown on this page, can be seen at the Museum of Holography, 120 West 20th St., New York, N.Y. 10011. ★ ★ ★



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BY MORT SCHULTZ

CAR CLINIC

Diversionsary lactics

My 1972 Chevrolet Vega is driving me up the wall. I replaced the distributor cap, ignition wires, PCV valve and exhaust-system parts. I've set the carburetor to specification, but nothing has gotten rid of a back-firing out the exhaust when I decelerate. The noise sounds like fire-crackers. Please help.—Kenneth Muro, Elmont, N.Y.

I'll bet the diverter valve is bad. It's mounted on the air pump of the A.I.R. (Air Injection Reactor) system to control the airflow into the exhaust system. If the valve has failed, excessive pressure is building up that's relieved as air escapes from the tailpipe when you let up on the gas pedal.

Test the valve. With the engine idling, check to see that air is not escaping from the valve by placing your hand over the valve ports. Now, momentarily pinch the vacuum hose connected to the valve. Air should exhaust from the valve for about five seconds when pressure on the vacuum hose is released. Most times you will be able to hear the exhaust-ing air.

To replace a diverter valve that fails the test, disconnect the vacuum hose and the larger hose from the valve. Remove the two screws holding the valve to the A.I.R. pump. Remove the valve, and be sure to clean off all gasket material. Install a new valve using a new gasket.

Datsun doodles

At the 600-mile service on my '74 Datsun 610, I complained of a rear-end noise when cruising at 45 to 55 mph. It is a definite grind. At 2500 miles, my dealer finally received authorization to install a part that hasn't done one bit of good. Now I am told all 610s have this condition. Am I stuck?—Russel W. Kuapp, Palm-dale, Calif.

I don't know whether you're stuck or not, but someone may be giving you a snow job. It's true that many 610s and Z model Datsuns with independent rear suspension have a "normal" whine. However, if the whine is objectionable, it can usually be reduced if the car has low mileage

by adjusting the clearance between the ring and pinion. If the car has high mileage, the ring and pinion should be replaced if you can't live with the noise.

But you speak of a grinding noise that occurs between 45 and 55 mph. That's a heck of a lot different than the whine I've been describing which occurs below 45 mph. I think you have a bad bearing in that rear end which should be replaced. I'll bet on the front pinion bearing, but whatever, your dealer should repair it under the warranty. If he doesn't want to, ask him to call in the Datsun field representative and let him judge the case.

Medical case

At 28,000 miles, the left rear bearing of my 1971 Toyota Corolla 1200 failed and was replaced. Less than 6000 miles later the new bearing and seal went bad. I've been riding on another new bearing for a while, and I may be getting paranoid, but I swear I'm hearing noise again. I don't do any unusual driving, and I don't carry heavy loads. I hope you can advise before I get an ulcer.—Dan Lawson, Flushing, N.Y.

I assume you are referring to the left rear-axle seal and bearing, Dan. If you are, then it is likely that when the bearing failed for the first time it seized and scored the axle housing. If so, replacing bearings and seals is fruitless. The scored housing will cause failure of new parts within a short period of time. Your logical solution is to replace the damaged housing.

Call the undertaker

For a long time my 1969 Ford pickup (360-cu.-in. engine) would suddenly gasp and die on a long, hard pull—just as if I had turned off the ignition. It got real hairy at times, because I haul a 7000-lb. camper on the pickup over some rough mountain passes. No mechanic could find the cause of the problem, because it just never occurred on the level. Then one day while searching for the source of a raw gasoline odor, I

found the trouble myself. With the engine under heavy load, torque would twist the fuel flex line just enough to open up a pinhole, allowing air to be sucked into the fuel line. A new piece of line and two hose clamps have corrected this long-standing problem.

I enjoy your column. Keep up the good work.—Al Jones, Fort Worth, Tex.

With guys like you feeding me stuff like this, I can't miss.

Shocking experience

On mornings when the temperature drops below 30° F., I get a stiff jolt when I put the key into the ignition of my 1973 Buick Century. What gives?—Mrs. Joan Metko, Linden, N.J.

Maybe your clothes, if you usually wear woollens in cold weather. Wool retains static electricity that "let's loose" when you touch the key to the switch.

Woollens or not, let's try a few things to solve the problem. The easiest attempt at a solution is to buy an antistatic electricity compound in an aerosol spray can that is sold by most auto supply and department stores. Spray it over the upholstery. If this fails to relieve the shock, buy a static strap and have it installed to a good ground in the rear of the car, such as where the bumper meets the frame.

Highway rodeo

My 1973 Plymouth Satellite starts with a bang and idles so fast I can hardly shift gears. It happens every morning, winter or summer, and continues until the engine warms up. I have to keep my foot on the brake pedal as I drive out of the garage and for the first few blocks. After it warms up, it runs like a top. When I get the car to the mechanic, it's warm and running beautifully, so he looks at me as if I've flipped. I'm no mechanic, so I don't need a big write-up. Just answer a question for me. Is this normal?—E.O. Hirt, Chicago.

You had better get that engine's
(Please turn to page 52)

He's just won \$25,000,
poured a bucket of champagne
over his head.
He's not going to follow all
that with a boring cigarette.



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Kings, 16 mg. "tar," 1.1 mg. nicotine, av. per cigarette, FTC Report Oct. '74



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CAR CLINIC

(Continued from page 50)

fast idle and choke settings back on target before you wear out your brakes or run off the road.

SERVICE TIPS

■ **Chrysler's overheating problem.** In the August, 1974, *Car Clinic* we printed a service tip about overheating problems being experienced by many Chrysler Corp. cars. We have since received telephone calls and letters from Dodge, Plymouth and Chrysler owners who have taken their car back to dealer service shops for repair only to be met by skepticism. Service managers—some anyway—are actually disclaiming knowledge of the problem or of the many service bulletins which have been issued by Chrysler in an effort to solve it.

Well, enough of this nonsense. You take your car back to the service manager and defy him to tell you that the service bulletins I'm about to cite don't exist.

Let's start with service bulletin 09-13-73C (Chryslers and Plymouths), 09-13-73D (Dodge passenger cars) or 09-09-73T (Dodge trucks). Entitled "Engine Cooling—Severe Overheating," this bulletin is dated Aug. 27, 1973, and provides 28 pages of instructions on solving the problem.

The most important part of this bulletin is a lengthy questionnaire that you are asked to help fill out. Your answers to questions regarding your particular overheating condition will direct a good mechanic to the cause of the problem.

Another service bulletin that applies to overheating trouble is 07-01-73C for Chryslers and Plymouths, and 07-01-73D/07-01-73T for Dodge cars and trucks. This bulletin, dated Jan. 24, 1973, points out that overheating and coolant loss may be caused by solder corrosion products forming at the radiator core tube ends, causing a restriction. This bulletin explains how to solve the problem.

And still another bulletin you can quote to those "know nothing" service managers is 07-02-74C for Chryslers and Plymouths, and 07-02-74D/07-03-74T for Dodge passenger cars and trucks. Dated March 11, 1974, it expands on the bulletin discussed in the previous paragraph. It applies to vehicles that overheat after radiators have been rodded and freed of solder corrosion.

That's not all. There is still another service bulletin. It is 07-03-74C for Chrysler and Plymouth, and 07-04-74D/07-04-74T for Dodge cars and trucks. Date: Aug. 26, 1974. It explains how to make sure that the viscous fan drive is not causing overheating.

Now let's see some of those service managers try a cop-out! ★★★

GOT A PROBLEM WITH YOUR CAR?

Just ask Mort about it. Send your question to the *Car Clinic*, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems that are of general interest will be published in the column.

The man who'd rather drive a truck than a car.

He's got a nose for trucks.
And a feel for trucks.
Most of all, he's got a head for trucks.
And he uses them all when he buys his Dodge.

He opens up the hood and takes a long hard look inside. This man does a lot of his own work. And he wants to be sure he can get his hands on things.

Four-wheel drive. Good. Dodge is famous for that. Has been since World War II. And this man can make good use of it. For one thing, there's rarely a day when he does his driving all on a nice paved road. Some days there's no road at all.

He takes the measure of the payload. He'd better. A man who'd rather drive a truck than a car doesn't leave his wheels at some parking lot all day. He works his truck like he works himself. He spends a big chunk of his day in it. He grows attached to it almost by the seat of his pants.

So it counts that the payload is big. And it counts that Dodge has a tailgate that comes off easily.

Without a wrench.

Another thing. This man is rarely a desk jockey. If his truck doesn't work, neither does he.

So he finds a lot of comfort in the Electronic Ignition. What it does is very simple. It eliminates points and condenser. That means fewer tune-ups and surer starts.

The man who'd rather drive a truck than a car has another rare characteristic: he doesn't head for the highway to get away from his kids. He likes to have them around.

And he'll always be a little bit grateful to Dodge for the Club Cab... so he doesn't have to squeeze the family out.

Next time you're in some spectacular part of this country, keep an eye out for him.

The man who'd rather drive a truck than a car. We're proud so many of them would rather drive a Dodge.



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HINTS

FROM READERS



Soldering aid from socket

Remove the screw shell from a porcelain receptacle. Mount the socket on the wall of your workbench tool panel and fill it with steel wool. It will prove convenient for keeping the tip of your soldering iron or gun clean.—*H. Miller, Oroville, Calif.*



Renewing glove tips

Heavy welding gloves often wear out at the fingertips, while the rest of the glove remains serviceable. Coating the holes and tips with epoxy will more than double glove life and does not hinder their use.—*Tom McCanna, Woodstock, N.Y.*



Keeping lotion on hand

A bottle of hand lotion is always handy in your shop when kept on the tool panel, and a standard coat hook mounted horizontally makes a perfect holder for a 10-oz. bottle. A slight tug on the bottle frees it when needed. Two screws secure the hook.—*R. C. Rask, Denver*



Cord holder

To keep excess appliance cord coiled neatly, notch and bend thin aluminum or plastic to shape shown (use escutcheon plate as a pattern). Round all edges. The existing mount-in screw will hold the cord keeper in place behind the plate.—*M. G. McMullen, Santa Margarita, Calif.*

Chrysler: "The Great Getaway"

Pick yourself a spot where you can forget the everyday world and leave boredom behind.

And when you go take plenty of power to get you there and back. Like this Chrysler Funster powered by the famous Chrysler 60, with exclusive Magnapower II ignition. It's dependable. It's powerful. And it's designed simply — for ease of service. Let Chrysler take you out of the ordinary and power your Getaway with engines ranging from 3.6 to the 135. Take your choice and hang it on a Chrysler Hydro-Vee, Runabout, Cruiser, Bass Boat or Sailboat. See them at your Chrysler Crew dealers.



Two more ways to Getaway: Check your TV listing for Chrysler-sponsored "Fishin' Hole" and "Water World."

The whole neighborhood wondered what Frank Mallon was up to in his workshop.

Word had it he was up to something mighty peculiar. And when he didn't show up for bowling practice one Wednesday night, the Wabash Cannonballs (that was the name of his neighborhood team) began to wonder, too.

So it was that a bunch of the boys decided to pay their "star" a visit, and talk him out of his workshop and back into action.

It didn't happen that way, though.

Matter of fact, it was Frank Mallon who talked the Wabash Cannonballs out of their bowling night and down into his workshop. What was it... what could be exciting enough to keep a bunch of ten-pin tigers from their favorite pastime? One of the most fascinating learn-at-home programs in the world, that's what!

Actually build and experiment with the new generation color TV in Bell & Howell Schools' fascinating learn-at-home program. It will help you develop new occupational skills as an electronics troubleshooter.

You'll set up your own electronics laboratory to learn first-hand, the technology behind such innovations as digital-display wristwatches and tiny pocket calculators.

In fact, as part of the program, you'll actually build and experiment with a 25" diagonal color TV incorporating digital features.

But most important of all will be the new skills you'll develop all along the way... the kind of skills that could lead you in exciting new directions. While we cannot offer assurance of income opportunities, once you've completed the program you can use your training:

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2. To upgrade your current job.
3. As a foundation for advanced programs in electronics.

Go exploring at home, in your spare time. No traveling to class. No lectures. No one looking over your shoulder.

Bell & Howell Schools wants to introduce you to the modern way to learn. It means you'll be able to develop new skills in your own home—on whatever days and hours you choose. So you don't have to give up your present job or paycheck just because you want to learn new occupational skills.

What's more, we believe that when you're exploring a field as fascinating as electronics, reading about it is just not enough.

That's why you'll get lots of "hands on" experience with some of the most impressive electronic training tools you've ever seen.

No electronics background necessary.

That's one of the advantages of this program. We start you off with the basics and help you work your way up, one step at a time. In fact, with your first lesson you receive a Lab Starter Kit to give you immediate working experience on equipment.

You build and perform exciting experiments with Bell & Howell's Electro-Lab®, an exclusive electronics training system.

First comes the design console. After you assemble it, you'll be able to set up and examine circuits without soldering.

Next, you'll put together a digital multimeter. This instrument measures voltage, current and resistance, and displays its findings in big, clear numbers like on a digital clock.

Then comes the solid-state "triggered sweep" oscilloscope. An instrument similar in principle to the kind used in hospital operating rooms to monitor heartbeats. You'll use it to analyze the "heartbeats" of tiny integrated circuits. The "triggered sweep" feature locks in signals for easier observation.

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This 25" diagonal color TV has digital features that are likely to appear on all TV's of the future.

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You'll also gain a better understanding of the exceptional clarity of the Black Matrix picture tube, as well as a working knowledge of "state-of-the-art" integrated circuitry and the 100% solid-state chassis.

After building and experimenting with this TV, you'll be equipped with the kinds of skills that could put you ahead of the field in electronics know-how.

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696 R2



Onscreen digital clock

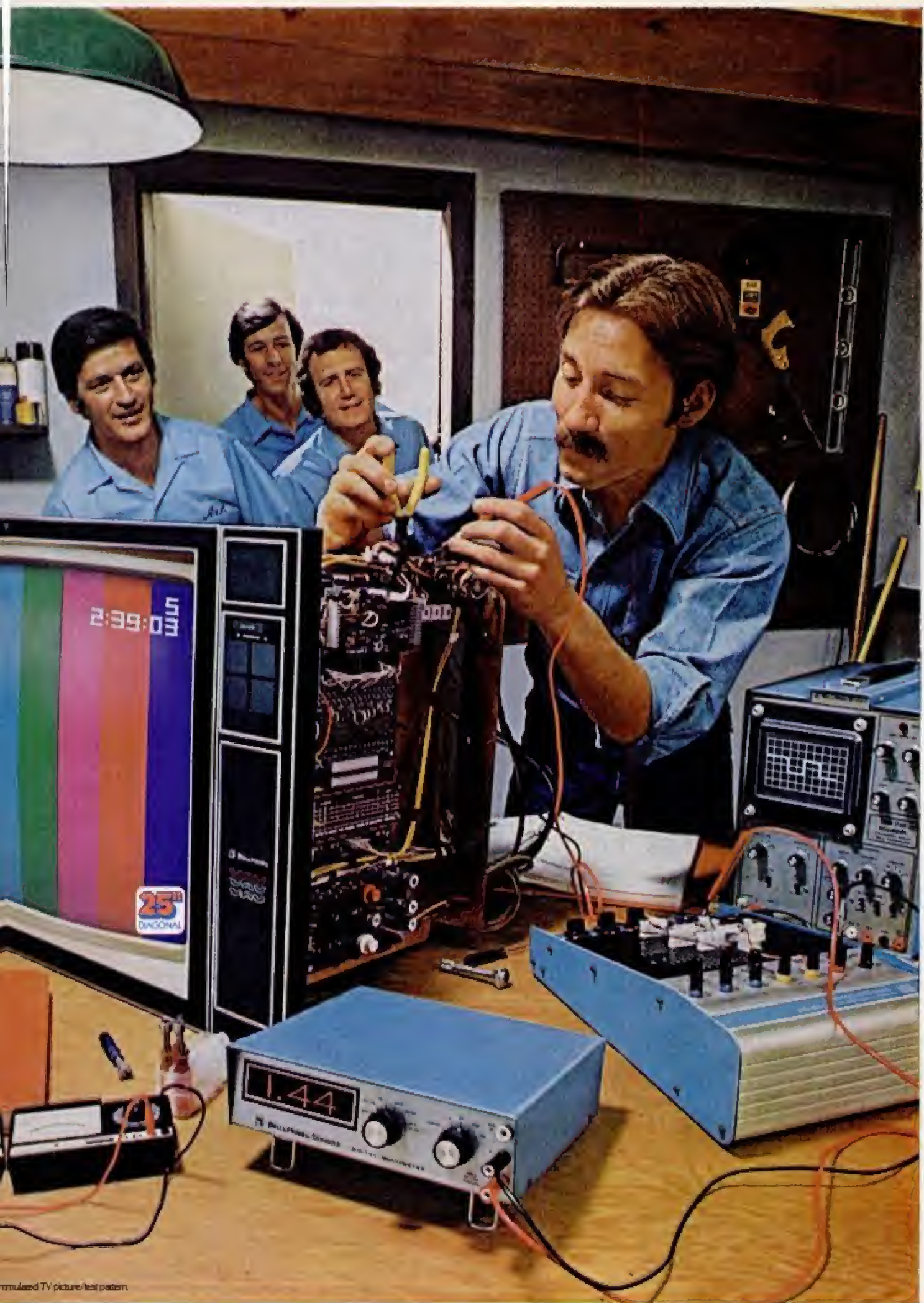


Channel numbers that flash on the screen



Automatic pre-set channel selector





Simulated TV picture/test pattern

who says
the shortest
distance between
two points
has to be
a straight line?



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QUESTIONS ANSWERED BY W. CLYDE LAMMEY

HOMEOWNERS' CLINIC



Puffing fireplace

I have a natural fireplace in a basement recreation room. When my gas furnace kicks on, the fireplace smokes—that is, a puff of smoke enters the room each time the gas burner starts its cycle. The fireplace upstairs is unaffected. What's the cause of this? And the remedy?—Lester Towns, Troy, N.Y.

Your basement must be nearly airtight. When the burner kicks on, warm air rises in the furnace flue by convection. Air pressure in the basement is equalized by air drawn down the fireplace flue, forcing smoke and gases from the natural fire into the room.

Opening a basement window slightly or leaving the door to the basement stair open should cure or at least minimize the problem.

Two stories or one?

I live in an older home and plan to build a new one on property I own in a better section of town. I'm inclined toward a two-story house but am still undecided; the split-level type is not very much to my liking. What is your opinion?—J. Horowitz, Pittsburgh.

Your local architect and builder are in a better position to advise you. If present-day construction costs are not a limiting factor, I would prefer the two-story house with traditional architectural lines to the seemingly more popular low-profile structure. In some localities it is cheaper to build a second floor than to spread out to obtain equal floor area. Two-story houses are also more economical to heat.

Will insulation harm shingles?

I've built up the insulation in my attic from 3 to 7 in., the original 3 in. being batts. Now I'm told that this will greatly accelerate the deterioration of the composition roof shingles. If this is so, how?—Gene Cowdry, Dubuque, Iowa.

If I were you, I would continue to sleep soundly. Your attic will be colder in winter and perhaps hotter in summer without added ventilation, and there is an opinion that this will

tend to shorten shingle life, but I doubt that this reduction would be more than three years on the average, if that much.

Condensation woes

Despite storm sash on all windows in my home (all storm windows are on hangers with hook closures), some windows sweat while others stay clear. On some the storms sweat; on others the inner glass is fogged. Why is this, and what can I do about it?—Robert Mayer, Northfield, Mass.

If the inner sash leak warm air, then the outer ones sweat, as you say. If the reverse is true, then the inner ones sweat. The remedy is a tighter fit of either the inner or the outer sash on each sweating window. Weatherstripping on the inner sash and turnbuttons on the outer ones will usually do it, or at least reduce condensation to the point where it is no longer objectionable.

Clock running wild

What's wrong with an electric clock that gains as much as an hour or two in a day? It's a battery-driven type, and I was told that the battery should last a year. But I've only had the clock a few months.—Miles Osborne, San Francisco.

The battery is nearly exhausted. This type of clock will become inaccurate as the battery nears total failure. Most clock batteries will last a full year, but have a limited shelf life, and it's possible that yours was old and was not tested before it was placed in the clock. Install a fresh battery—have it tested—and then see how the clock runs. If it needs regulation, look for a tiny exposed screw on the back of the movement and adjust this screw until the clock keeps good time. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.45 postpaid. Send orders to PM, Dept. HC5, Box 1014, New York, N.Y. 10019.

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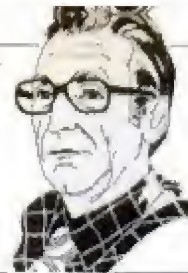
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Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Oct. '74

SCIENCE WORLDWIDE



The man is for burning



A life-sized, highly instrumented mannequin is now being used by Du Pont Co. researchers to measure the probable extent and severity of burn injury in tests of garment and fabric flammability. Called Thermo-Man, the mannequin is equipped with 114 heat-sensing devices (indicated by white rings in photo). Electronic gear, some of which is contained within Thermo-Man's abdomen, is capable of recording about 20,000 temperature measurements a minute. Computers in the system translate readings into a record of skin surface and tissue temperatures and damage at varying depths and over precise areas of the body. Originally, the mannequin was constructed by the Acurex Corp. for an Air Force study of protective clothing.

Easy on the chow!

Many dog owners may be injuring their pets by giving them too much food containing calcium, according to a Cornell University veterinarian. "Excess quantities of calcium, often found in nutrient supplements, can result in severe skeletal deformation in large dogs," says Dr. Lennart Krook. "Overnutrition can be as dangerous as undernutrition."

In one study reported by Dr. Krook, "overfed" Great Danes were found to be suffering from excessive

bone formation, retarded maturation of cartilage and decreased resorption of bone, a process normally needed to accommodate the changing structure of growing skeletons. The dogs suffered from lameness, moved clumsily and were sensitive to manual examinations.

Basis for new engine?

A virtually pollution-free engine that runs on "cool burning" fuel may result from designs now under development at laboratories of the General Electric Co. Such an engine could be built around the concept of burning fuel in a device called a "transpiration burner," developed originally as a tool for research in combustion processes.

A premixed flow of fuel and air is fed through a flat, porous plate in which cooling coils are embedded. A flat sheet of flame burns steadily above the plate, and the flame's temperature is reduced below what it would normally be as heat is absorbed by water in the coils. Reduction of flame temperature is vital to reducing pollutants, particularly oxides of nitrogen. The transpiration burner creates about 15 parts per million of nitric oxides while the



typical, hot-burning auto engine produces about 600 parts per million, according to GE researchers. Studies are being made into possible use of the transpiration burner as the basis

for an automotive steam engine or gas turbine.

Rare beefalo steaks

The "beefalo," bred from a buffalo and a cow, is being hailed by some cattlemen as the animal that will save the industry in years to come. The hybrid—first successfully bred in 1970 by a Californian—reportedly has twice as much protein and about 30 percent less fat than today's beef cattle. The animal does not need expensive grain but can get all his food in a pasture, cutting expenses significantly. It will be several years, however, before the supermarket will offer beefalo steaks because only a few hundred of the critters exist—and they are breeding stock. The meat reportedly is similar to beef, but dryer.

New diagnostic tool



Standard X-ray has its limitations: It can't provide good detail of some organs and parts of the body. Researchers recently have come up with other methods of getting pictures. One is a gamma camera developed by the Raytheon Co. to detect organ damage, blood clots, tumors and other abnormalities. A radioactive substance is injected, then the organ under study is scanned by the camera, recording gamma-ray radiation. Result: a clear, detailed picture. Photo shows technician examining two brain scans made by the new instrument. ★★★

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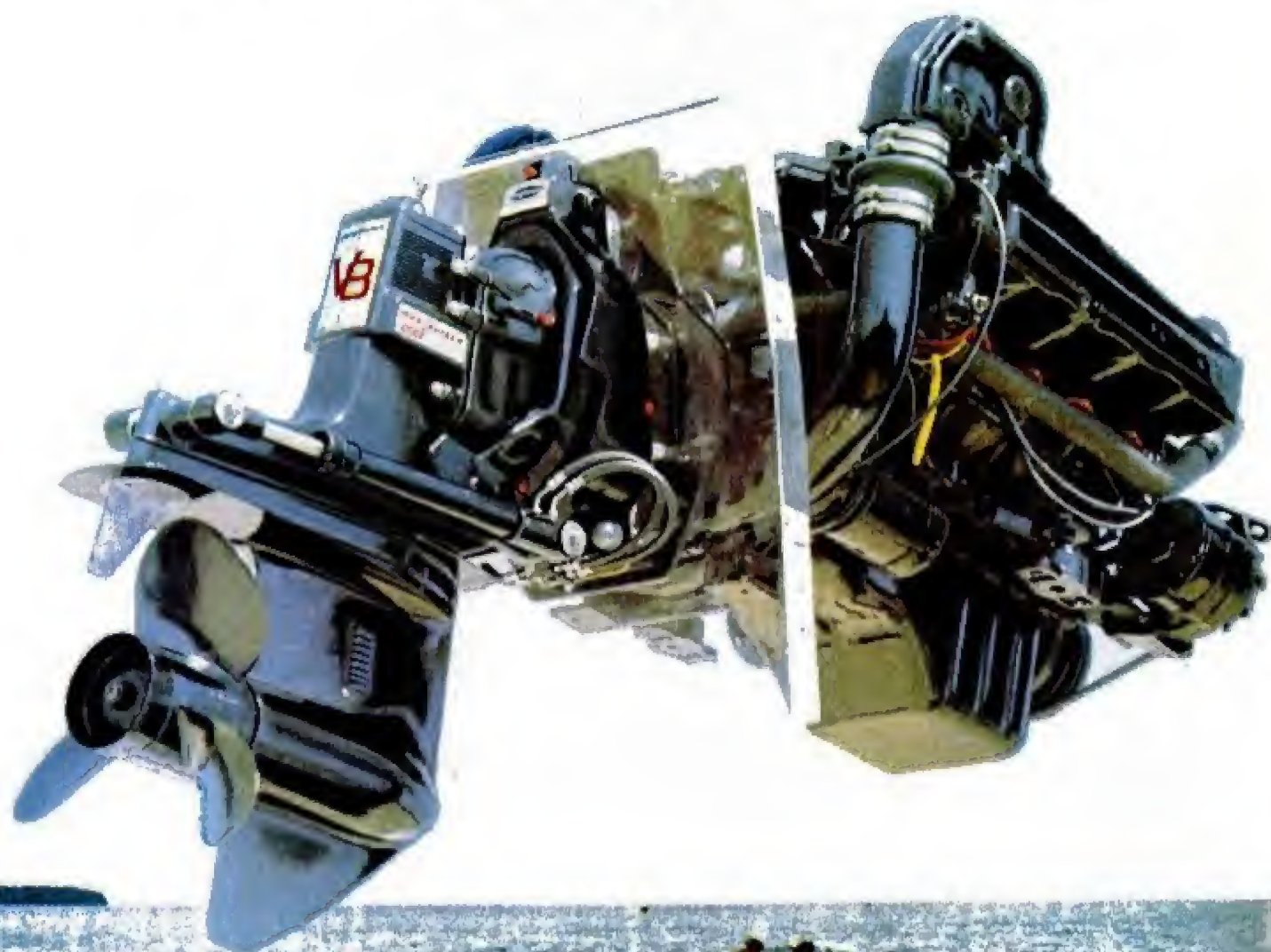


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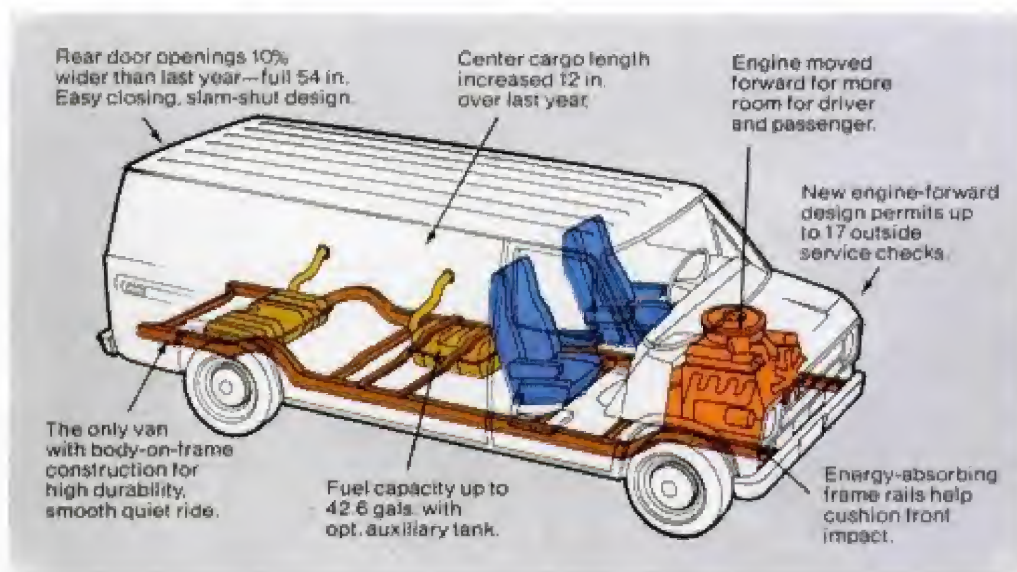


For Power Trim, call 714-360-1200. For 150, 175, 200, 230, 255, 280
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New value. Now you have a whole new set of facts to consider in choosing your next van. Ford's new generation of vans creates room and comfort inside, new servicing ease outside...it's a lot of van. Shown with optional Chateau trim, radio, wheel covers, mirrors, whitewall tires, Tu-tone paint.

Ford redesigns the van.



**Introducing '75 Ford Econolines
with basic advances in room,
comfort, durability
and all-around usefulness.**

A new generation of van value.



New comfort. Econoline '75 establishes a new standard of van comfort, both for business and personal use. Move-around room for feet and legs is increased over last year... on the passenger side, too. Van interior shown with optional Chateau trim, radio, Captain's Chair, air conditioner, automatic transmission.

New comfort

Econoline '75 is a whole new money's worth for the van buyer. It is designed as much for people as for things... brings you a new level of driving comfort. Engine and front axle have been moved forward, wheelhousings are out of your way, door openings are taller. The driver area is more spacious, with ample move-around room and seating comfort.

It's easier for the driver to step in and out on the wide step, to move from his seat to the load area, to step across to the passenger side, or to use the passenger-side door.

And Ford offers new options to the driver who wants to outfit his van... who "lives" and works in it all day, or uses it for pleasure.

Examples: woodtone finishes, cut-pile carpeting, one-way glass for privacy in rear doors and in Window Vans, sidewall-mounted auxiliary air conditioning/heater system, wide range of Tu-tone paints.

You'll find the Econoline '75 has a new "command" feeling—in ride, in road-hugging stability, in handling ease—and the quiet that says quality. It's the kind of quiet you get with an out-front engine and vibration-dampening body mounts.

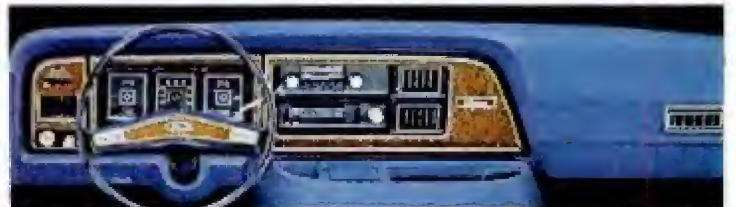
Compare the '75 Ford Econoline with your van. Or any other van. Compare value for your dollar...compare on any basis you wish.



Standard seat is full foam, contoured for all-day driving comfort. Optional passenger seat offered. Easy to step into cargo or passenger area.



New easy entry. Econoline '75's door openings are taller than last year—wheelhousing is moved forward out of the way. New wide step. Optional Captain's Chairs pivot both ways, have fold-down arm rests.



▲ New driving ease starts with well-designed instrument panel. New optional integrated air conditioner/heater system is built into dash. Note utility pockets molded into engine cover.

◀ New roominess. Ford has moved engine forward nearly 18 in. You enjoy new freedom of movement. Driver can use either door

New Durability, New Choices ►

New durability

Econoline '75 is the only American van to have a separate frame and body. This type of construction makes for rugged strength... and permits a solid ride because the body is mounted to the frame on strategically-placed rubber mounts. These mounts are designed to isolate the body, driver and load from the frame.

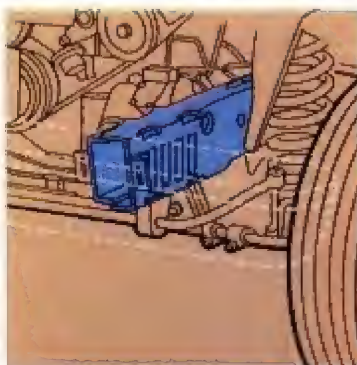
To help protect the regular van and wagon bodies from the effects of time and weather, key body components are galvanized, and the entire body is primed by a deep-dip electrocoat process. Econoline '75 is built to keep its value.

Durability under the hood: Econoline '75's standard engine is a 300-cu. in. Six, for performance with economy...big 11-in. clutch, standard. Two V-8's available, 351- and 460-cu. in.

Also standard: Power front disc brakes for good control with low pedal pressure. Improved Twin-I-Beam front suspension, still a Ford exclusive, contributes to front-end toughness and stable ride.



The bigger, higher windshield of Econoline '75 provides improved visibility. Better to see traffic lights overhead, both fenders down in front. Washer jets are right on wiper arms for effective spray.



Energy-absorbing frame rails help cushion front impact.



Ford's anti-corrosion measures promote long life, help protect your investment in the new Econoline '75.

New choices

New power choices: 300-cu. in. Six is standard. Options: 351- or 460-cu. in. V-8.

New model choices: Now four series of Regular Vans, with new wheelbases, 124- and 138-in....greater GVW's, to 10,000 lbs. Also offered as Window Vans. Club Wagons to 8,750 lbs. GVW. Cutaway chassis, 138- and 158-in. wheelbase, have GVW's to 11,000 lbs. with dual rear tires.

• Ford Parcel Delivery Vans now offer stand-up bodies 12 or 14 ft. long, 7 or 8 ft. wide. Single or dual rear tires.

• Cutaway chassis now take mini-motorhome bodies up to 21 ft.

New options: Tailor your new '75 Ford Econoline to your needs and tastes:

- An auxiliary fuel tank increases total fuel capacity up to 42.6 gallons.
- Auxiliary air conditioning/heater system has outlets along the sidewall.
- One-way glass for privacy in rear doors and in Window Van, AM/FM/MPX stereo, radial tires, Speed Control.
- Choice of hinged or sliding side cargo doors.
- Front stabilizer bars for improved handling.

See your local Ford Dealer. Look close at the new '75 Econoline...the all-new van, today's big van value.



New Ford Parcel Delivery Vans. Up to 40% more cube than last year. 12-, 14-ft. bodies.



Mini-motorhome chassis. GVW's to 11,000 lbs. Single or dual rear tires. For bodies to 21 ft.

New '75 Ford Club Wagons. 5-, 8-, 12-passenger. Optional Chateau Trim Package shown, with radio, wheel covers, whitewalls, mirrors, Tu-tone paint. 3 trailer towing packages, for GCW's to 16,300 lbs.



FORD ECONOLINE VANS

FORD DIVISION



VACATION HOMES

10 great designs
for leisure living

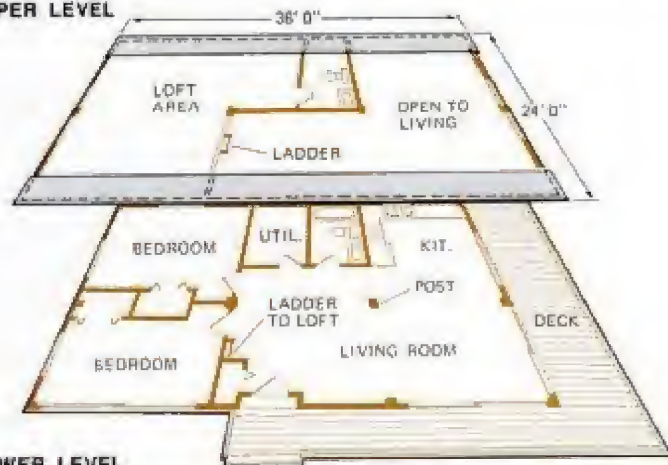
by Harry Wicks, WORKSHOP EDITOR

Despite cries of tight mortgage money, as many as 300,000 Americans are expected to take ownership of vacation homes this year. We've rounded up 10 typical homes that they will be moving into—prefabs, a condominium and three built from stock plans. The comfortable house here is an economical route to second-home ownership. If you want to finish the interior yourself, you can have a livable shell erected for about \$18,500.

For more details on any of these homes, write the manufacturers.

American Barn, 129 Elm St., South Deerfield, Mass. 01373

UPPER LEVEL



LOWER LEVEL



American Barn IV has the warm characteristics of a renovated barn with features found in today's better contemporary homes.



UPPER LEVEL

BEDROOM

DN

BUNK RM

24' 0"

OPEN TO LIVING

STOR

LOWER LEVEL

BEDROOM

UP

LIVING ROOM

KIT

DECK

A country hideaway

This complete family-sized house with two large bedrooms and a bunk room is cozy enough for two or can be arranged to sleep up to 10 comfortably. Just one of 30 designs offered by the manufacturer, the Nutshell 900 features a balcony which overlooks a cathedral-ceilinged living room with 16 feet of glass. The glass opens on a spacious deck to let you view your lake, mountain or surf.

House size is 24x28 ft. with 912 sq. ft. of good living distributed over two levels. On your lot, the cost is about \$15,000 for a shell or \$24,000 complete.

Acorn Structures, Inc., Box 250, Concord, Mass. 01742

All fun and no work

Owning a condominium is the ideal way for many to have a second home. You can enjoy provided recreational facilities—such as swimming, hiking, fishing and golf—full time because condominium programs usually include exterior maintenance of your property. Sunriver, located on 5500 acres of unspoiled Oregon landscape, permits buyers the choice of either multi or single-residence dwellings. Environmental protection occupies a position of top priority in all planning. For example, the housing is grouped and contained within the timberline, and the golf courses are laid out to serve as green-belt buffer zones between the activity and wildlife areas.

Sunriver Properties, Inc., Sunriver, Ore. 97791
Photos: Western Wood Products Assn.

Rustic, contemporary and spacious

Mountain Haus design lets youngsters take over the upstairs to make it their domain while you remain down. The floor plan is clutterfree and features three bedrooms, two baths and a roomy 14x24-ft. living room. The preconstructed module design lets you build up or out as lot size permits; units can be put together in a variety of bilevel and ground-level patterns. You can arrange modules to build a home of from one to five bedrooms, and the dwelling can be purchased as a shell if you opt to finish the interior yourself. Total living space of the four-module unit shown is about 1250 sq. ft.

Vacation Land Homes, Inc., Box 202, Bellaire, Mich. 49615

Custom designs with a natural look

If money abounds, you can indulge yourself by custom building the house of your dreams with the help of a reputable architect. The three ski cabins shown—far left in Utah, the other two in Colorado—were designed to blend harmoniously with surroundings, and cedar shingles used on the exteriors were left to weather naturally. The pair on the facing page have steeply sloped mansard-type roofs to shed snow loads quickly. The house at the near left is structurally designed to adequately support the heaviest of snowfalls.

Red Cedar Shingle & Handsplit Shake Bureau,
5510 White Building, Seattle, Wash. 98101

**Think big—
but start small**



Building a five-stager is a good way to have a vacation home fast. Plan 890-1E provides almost immediate living quarters because you first build the kitchen-bath-family room module (left). The four remaining stages can be erected in any order you prefer; the set of plans for this house contains one copy of each stage. When completed, the all-on-one level home boasts three bedrooms, two baths and a two-car garage. Note that each of the three independent decks at the rear is accessible to the room it abuts through a pair of sliding glass doors to provide outdoor living space. The family room doubles as a dining area with an open counter between it and the kitchen serving as a snack bar. Plan-ordering information for the three built-on-site homes shown on the facing page appears below.

**Carefree and casual
by the beach**



Impressive contemporary is a good choice for a summer home now and a retirement home later. The exterior is finished with maintenance-free materials which will take the abuse of high winds and salty ocean spray at the seaside; the surrounding terrain is left as undisturbed as possible. A second level balcony overlooks the living room with its glassed wall to the patio and view beyond. Whether he or she handles the kitchen chores when entertaining, neither one will feel left out of the activity taking place in the living room—a wall cutout (see left) is provided between these areas to keep both host and hostess in touch with their guests and good times.

**For ski buffs
and snow-country lovers**

After an exhilarating day on windswept slopes, skiers will happily return to your spacious, but cozy, modern chalet. The design here meets the demands of what skiers expect in a leisure home. Since most skiers prefer their activity in a group, sleeping accommodations for an almost unlimited number of guests is possible—the balcony can simply be furnished with dormitory-style bunks. Those who prefer to rest for the next day's activities won't be kept awake by evening revelry because the rec room is in the basement, well away from the sleeping quarters. Generous decking at the front and rear provides more than enough space for parking ski gear; ample storage room is tucked into the attic so that ski equipment can be safely hidden between seasons.

HOW TO ORDER PLANS

Plans for each of the three homes on the opposite page are available from Home Building Plan Service, Dept. PM, 2235 N. E. Sandy Blvd., Portland, Ore. 97232. Prices are \$35 for one complete set or \$50 for four sets of the same plan (except the five-stager—Plan 890-1E—which can be purchased for \$75). A plumbing and wiring diagram is available from the same source for \$10 and a materials list costs \$5. When ordering, make certain that you specify the plan number and the number of sets you want.



PLAN 890-1E



Living area: 1520 sq. ft.

Garage area: 484 sq. ft.



PLAN 889-1A



SECOND FLOOR PLAN

FIRST FLOOR PLAN

Living area: 598 sq. ft.
Storage area: 160 sq. ft.

Living area: 1155 sq. ft.
Garage area: 450 sq. ft.



PLAN 895-1



FIRST FLOOR PLAN

Living area: 1440 sq. ft.

Living area: 312 sq. ft.



SECOND FLOOR PLAN



BASEMENT PLAN

Grow a vegetable bonanza in a small plot

by James Dwyer
and John Albert

With food prices climbing faster than Jack's beanstalk, more and more homeowners are converting lawn areas into vegetable gardens. Not only can a home garden help ease the food budget, but your own produce will have a lot more freshness and flavor than anything you're likely to buy at the supermarket. If you have a spacious freezer or are good at canning, your vegetables can add zip to meals all winter.

It may be years since you tried your hand (or green thumb) at raising food for the table, so you may have questions: How big a plot do I need? How often is fertilizer required? When should I plant which vegetable? What sprays do I use?

These and other questions are answered by our two authors. James Dwyer is assistant editor of the *Garden Journal*, published by the New York Botanical Garden, and the author of numerous articles on horticultural subjects. John Albert heads a Botanical Garden program in which 200 New York children learn how to grow vegetables in their own miniature garden plots.—*The Editor*

In gardening, the magic words are *sunlight* and *nutrients*. Your first step is to pick a spot for the garden in full day-long sun, where the roots of large trees are not consuming the lion's share of the soil's nutrients and moisture. A plot of only 6 by 15 feet—basic size discussed in this article—can produce plenty of food for your table. If you have more area, better still.

Fertilizers

Today's vegetables, hybridized for rapid growth and high yield, need help in the form of extra nutrients. You give them the needed boost with a complete fertilizer, formulated for vegetables. Most garden stores have

such fertilizers in five-pound boxes carrying designations such as 5-10-5, 5-10-10, 10-15-10.

The numbers denote percentages of nitrogen, phosphate and potash (in that order). Normally, before planting you'll want to work into the soil about five pounds of 5-10-5 per 100 square feet after each four weeks of growth. Use smaller amounts if you're working with a fertilizer of higher concentration.

In the growing season, never let fertilizer remain on leaves or within an inch of plant stems. It's wise to rake the soil lightly after each application and then give the whole garden a good watering.

Fertilizers that are completely sol-



Hoe handle pressed into ground (right) makes trench for planting seeds. Most seeds require half-inch-deep trench.

Cold frame for protection and propagation of plants should be placed against a south wall or tight fence. Since frame usually is without bottom, drainage must be good.

Good way to start seeds is in peat pellets. When sprouts are ready to be put out, you plant the entire pellet. Peat breaks down in ground.

uble in water are excellent for use during the growing season. Used as directed, they will not burn leaves.

Compact soil

Soil too tightly packed inhibits root development. During rainy periods it will waterlog, cutting off normal aeration both to the roots and to beneficial microorganisms. In dry periods, it will cake on top so that water from the hose runs off or forms puddles while the soil beneath remains dry. Eventually, the soil may crack under the hot sun and cause damage to tender root growth.

The remedy is to work into the soil (up to one-third the volume of the soil in your garden) compost mixed with sand or perlite. This will allow drainage.

Loose soil

Sandy soil is structurally the best for good root development, but if it is too sandy, it doesn't retain much moisture or nutrients. Solve the problem with compost or manure (again, one-third of the volume) along with peat moss. Since compost and manure break down to provide nourishment for plants, they should be replaced each year. Peat moss, while of no direct nutritive value, will remain in the soil for a long time, serving as a storehouse of water and fertilizer.

Acid or alkaline?

Soil pH is the measure of hydrogen ion concentration in the soil, which is, in turn, a measure of soil acidity. It can be determined to a fair degree



Fencing can be used to support cucumbers and melons, and let them climb. Tomatoes (right) should be staked when planted to avoid root injury later. Stakes up to seven feet high are recommended. Inverted paper cup at base of the plant will hold off hungry cutworms.





Before fall frost hits, cut off tomato vines at base and hang plants upside-down to force ripening of the remaining fruit. Onions will store well if hung in a dark, cool place.

of accuracy with a simple soil-test kit, obtainable for less than \$5 at a garden-supply store.

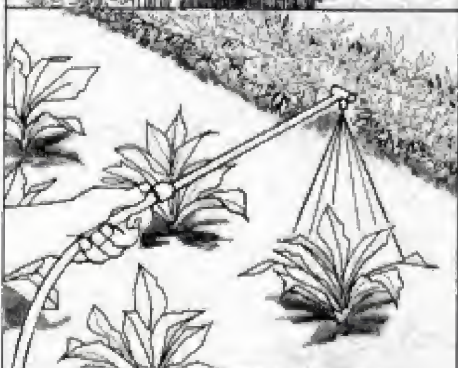
A pH reading of 1 is acid to the extreme, a pH 14 is as alkaline as you can get, and pH 7 is neutral soil. Most vegetables grow in slightly acid soil (pH 6 to 6.5). Much more acidity can be toxic to many plants, while very alkaline soil makes many trace elements unavailable to them.

The usual problem is acidity. If pH is below 5, add 10 pounds of ground limestone for each 100 square feet of garden. If it's only slightly low, make it 5 pounds. You can add it in the fall as a top dressing, giving you the chance to double check the reading in the spring, or put it on in the spring after having worked in the fertilizer. Rake it gently into the top inch of earth. Recheck the pH each year as lime is slowly leached out by rain.

If you live in an area rich in limestone, your soil problem is probably alkalinity. Fork in compost, manure, or peat moss to acidify. If the imbalance is extreme, say pH 8 or 9, add finely ground sulphur or aluminum sulfate.

Designing the plot

Maximum use of space is the keynote. Remember that space is three-



dimensional, and that sun in the northern hemisphere comes from the south, particularly in early spring and late fall. This means that plants should be arranged not only as closely together as their well-being permits, but with the taller ones to the north so they won't shade the others.

Plant tomatoes in a line along the northern edge, about a foot apart and tied up on stakes or cattle fencing. Pinch off side shoots during early growth. Today's varieties are very fruitful, so it doesn't take many plants for a good crop.

Cucumbers and melons should also be allowed to climb, but no staking for them—they need cattle fencing or chicken wire. Cucumber vines easily support their fruit this way, but you may have to rig cloth slings to support canteloupe and other melons as they get fully ripe.

Sweet peppers may need staking. The branches are quite brittle and crack easily under the weight of today's large peppers.

Plant cabbage and lettuce in twos or threes at close spacings. Head sizes won't be as large as they could be, but overall yield will be greater and be spread over a longer period. Harvest by pulling up an alternate plant every two or three days, as soon as the heads are developed enough to be edible. By the time you get back to the beginning of the row, the remaining plants should have nearly filled in the spaces. Don't let your lettuce harvest go into hot weather, as the heads will "bolt"—grow into stalks.

Beets, radishes, all the root vegetables, will benefit from the same alternating harvest principle, but practiced more extremely. Sprinkle seeds generously into a very straight, half-inch-deep trench—straightness will prove important when you're weeding the garden later—and let nature

When seedlings of root vegetables appear, thin out the weaker ones (left, top) until there are but three or four plants to the inch. This allows remaining plants to grow to a good size.

Though the best defense against disease and pests is to maintain strong growth in plants, you may have to resort to sprays. There is a wide variety of chemical agents available on the market.

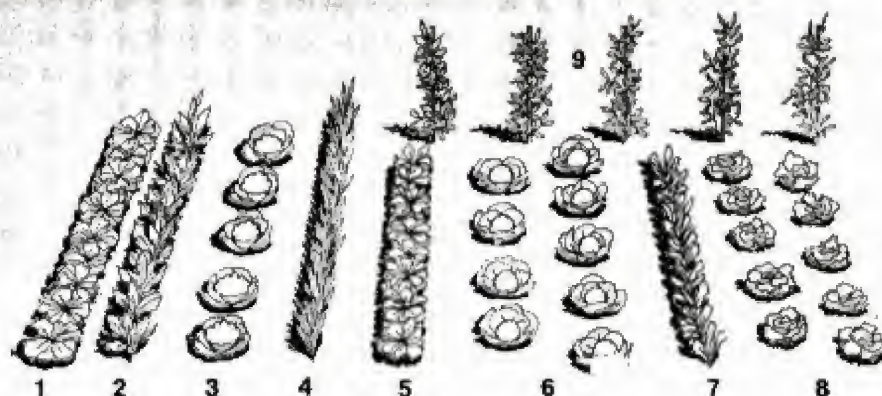
A good "instant" mulch is provided by plastic covering. It holds in heat, discourages weeds. Plants grow through cutouts; slits provide ample drainage.

If you have planted crops in straight rows, cultivating with hoe (left) is easy. A good time to weed is when the ground is moist from rain or watering.

SPRING

In spring, seedlings must be "hardened off"—gradually acclimated to outside temperatures—before planting in ground. Crops shown here can be planted well before the last frost of spring, just about the time ground is workable. Care must be taken with cabbage. If a cold spell hits and plants are subjected to a week or more of daytime temperatures below 50°F., heads will begin to form prematurely.

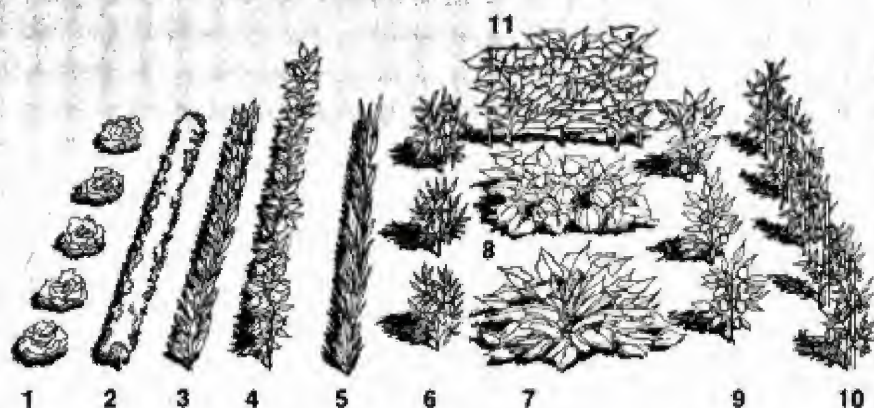
- | | |
|---------------------------|----------------------|
| 1 Spinach | 6 Early cabbage |
| 2 Beets | 7 Radishes |
| 3 Broccoli or cauliflower | 8 Early head lettuce |
| 4 Onions | 9 Peas |
| 5 Spinach | |



SUMMER

To give beans head start—and avoid possible frost injury—soak seeds indoors until almost germinated before planting in garden during a mild spell. Put in tomatoes, peppers and eggplant seedlings after all danger of frost is past. Follow in about a week with seed plantings of cucumbers, melons, pumpkins and squash.

- | | |
|---|-----------------|
| 1 Leaf lettuce | 6 Sweet pepper |
| 2 Carrots or parsley | 7 Zucchini |
| 3 Beets or kohlrabi | 8 Bush pumpkins |
| 4 String beans | 9 Eggplant |
| 5 Onions (from spring planting, harvest July) | 10 Tomatoes |
| | 11 Cucumbers |



FALL

Lettuce, cabbage, beets, radishes, carrots, spinach and peas can all be planted in August or even September, depending on your area's climate. Again, planting seedlings will mean more of a harvest before winter. In all but the coldest climates, you can plant leaf lettuce, beets, carrots, onions and spinach in the fall and allow them to winter over for an exceedingly early harvest next spring. During the coldest of winter weather, you should cover crops with good mulch.

take its course. When the seedlings have appeared, thin out the weaker ones until you're left with three or four plants to the inch.

Allow plants to grow to a point where fruit formation is evident. Now thin out sparingly. Though fruit may not be large, it certainly will be edible. From then on, you'll be able to gather a small bunch of vegetables every week or two, taking them alternately from the row. Tiny at first, they'll get bigger as the season advances.

Onions are particularly good to

grow in abundance. They can be stored by hanging them on a string in a dark, cool place, and will last all winter. You can buy onion "sets" (bulbs) at some garden shops for spring planting.

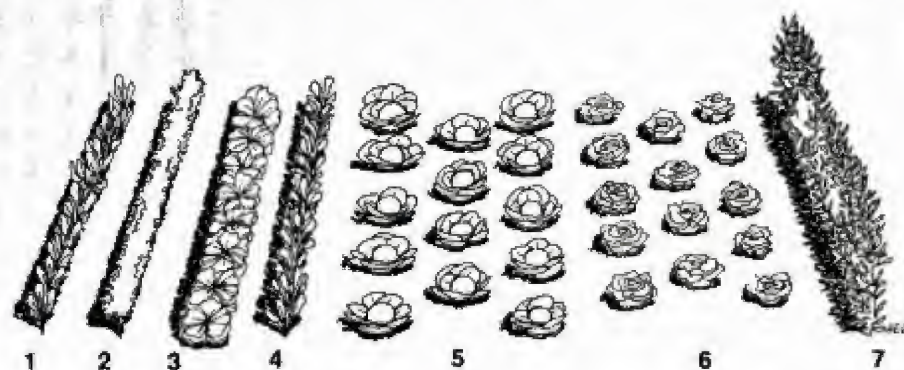
Starting seedlings

You can extend the productive life of much of your garden by starting seedlings in flats or pots. Tomatoes, eggplants and peppers will begin producing earlier and thus will last longer. Head lettuce will have time to head completely before the heat of

summer causes bolting (growing into stalks). For the cabbage family, transplanted seedlings mean an earlier harvest.

Sow seeds near the surface in flats containing about two inches of loose, well-drained soil, six to eight weeks before you plan to put plants in the ground. Maintain a temperature of 70° to 75° F. until the seeds germinate. When the young sprouts have produced their first set of real leaves, they are ready to be transplanted to small pots, to other flats or to a cold

(Please turn to page 130)



The tiller— a backsaver for busting sod

by Glenn Hensley



MAKE/MODEL		HP	TRANSMISSION	TILLER WIDTH	TILLER WIDTH WITH TINE EXTENSIONS	SPEEDS
ALLIS-CHALMERS		3	Worm Gear	21½"	31½"	Forward
		5	Worm Gear	22½"	33½"	Forward, Reverse
		8	Worm Gear	23½"	35"	Forward, Reverse
AMF	1346	4	Worm Gear	26"	32"	Forward, Reverse
	1349	5	Worm Gear	28"	36"	Forward, Reverse
ARIENS	3205	3	Worm Gear	20"	28"	Forward
	4205	4	Worm Gear	20"	28"	Forward
	424SR	4	Worm Gear	24"	36"	Forward, Reverse
	524SR	5	Worm Gear	24"	36"	Forward, Reverse
	624SR	6	Worm Gear	24"	36"	2 Forward, 2 Reverse
	424CD	4	Chain Drive	24"	36"	Forward
	720SR	7	Worm Gear	20"	28"	2 Forward, 2 Reverse
	720ER	7	Worm Gear	20"	28"	2 Forward, 2 Reverse
BOLENS	2135	3.5	Worm Gear	17"	38"	Forward
	2150	5	Worm Gear	21"	46½"	Forward, Reverse
GILSON	51073	3	Chain Drive	26"	40"	Forward
	51075	5	Chain Drive	26"	40"	Forward
	51080	3½	Worm Gear	26"	40"	Forward
	51084	3½	Worm Gear	26"	40"	Forward, Reverse
	51081	5	Worm Gear	26"	40"	Forward, Reverse
	51082	5	Worm Gear	26"	40"	Forward, Reverse
	51083	8	Worm Gear	26"	40"	4 Forward, Reverse
	51085	8	Worm Gear	26"	40"	2 Forward, Reverse
	51005	8	Worm Gear	26"	40"	2 Forward, Reverse
HUFFY	H160	3	Worm Gear	24"	No Extension	Forward
	H170	5	Worm Gear	26"	40"	Forward, Reverse
JOHN DEERE	324	3½	Worm Gear	24"	No Extension	Forward, Reverse
	624	6	Worm Gear	24"	34"	Forward, Reverse
SIMPLICITY	1003	3	Worm Gear	22½"	33½"	Forward
	1005	5	Worm Gear	22½"	33½"	Forward
	1008	8	Worm Gear	23½"	35"	Forward
TORO	58013	3	Worm Gear	26"	38"	Forward, Reverse
	58114	4	Worm Gear	26"	38"	2 Forward, Reverse
	58125	4	Worm Gear	26"	38"	2 Forward, Reverse
	58220	5	Worm Gear	26"	38"	2 Forward, Reverse
	58231	5	Worm Gear	26"	38"	2 Forward, Reverse
WHITE	Roto Boss 350	3.5	Worm Gear	26"	40"	Forward, Reverse
	Roto Boss 500	5	Chain Drive	26"	40"	Forward, Reverse
	Roto Boss 800	8	Chain Drive	26"	40"	4 Forward, Reverse
YARD-MAN	5020	4	Worm Gear	26"	36"	Forward, Reverse
	5030	5	Worm Gear	26"	36"	Forward, Reverse
	5120	4	Chain Drive	26"	36"	Forward
	5130	5	Chain Drive	26"	36"	Forward



Heavy-duty tiller with rear-mounted tines (upper left) is one of seven models offered by Ariens. Powered by a 7-hp Tecumseh engine, it has two forward, two reverse speeds. The 8-hp Simplicity unit (above) has 35-inch tilling width with tine extensions. The 5-hp Gilson (left) cultivates an area as narrow as 12 inches, a useful capability in a small garden.

Most machines permit stretching tilling width by adding extension tines. By adding a "bolo" tine extension to a Toro tiller, tilling width is increased to 38 inches.

Bolo blades are good for cultivating and are designed to clean themselves. Some units are equipped with "slasher" tines to chew through tough turf and tangled roots. The average machine will pulverize soil up to a depth of eight inches.

The typical tiller is equipped with worm-gear drive, recoil starter and weighs about 130 pounds.

Increased emphasis on safety features is apparent among the 1975 machines. For example, many have safety clutches that must be gripped in order to operate the machine. Control panels have been redesigned in a number of instances to add to ease of operation. Most machines have clearly labeled controls as an added safety feature.

As it is with other outdoor power hardware, the more horsepower you opt for, the more you pay. The smallest White unit, for example, a 3.5-hp job, sells for \$265. Move up to 8 hp and the price is \$444.

If these typical prices seem steep, you might consider chipping in with neighbors to buy a machine. Unlike a mower, a tiller isn't used every week.

Because of space limitations, the chart accompanying this article does not include every make available. The chart is intended to show a selection of the units dealers are offering. ★ ★ ★

Composting the easy way

Though composting is as old as the hills, new wrinkles have been added. University of California researchers claim the process need not take months, but can be accomplished in only 14 days.

They advise mixing leaves, stalks and other waste with manure, commercial fertilizer or other material containing nitrogen, and then shredding the mix. This produces a larger surface-area-to-volume ratio, giving bacteria a chance to work faster. Finally, you build the pile in six-inch layers, wetting down each layer. Keep the pile moist, turn it a few times during the next 14 days—and you'll have a rich, soil-building humus for flower bed or vegetable garden.

If you want to skip the task of building a compost bin, you can buy a lightweight, adjustable type made by the Judd Ringer Corp., Eden Prairie, Minn. As photos below show, the bin is of a grid design, permitting good aeration of the pile. For \$13.98 you get the bin, water-soluble tablets containing microorganisms that promote decomposition, and an instruction booklet.

A pamphlet describing the University of California method is available free from the Kemp Shredder Co., 1003 Kemp Building, Erie, Pa. 16512.



PM OWNERS REPORT: CHEVROLET MONZA 2+2



Monza 2+2 owners in our survey bought their cars during the month of October 1974, when it first went on sale as a brand new 1975 model. This month, the hatchback 2+2 is joined in the lineup by a formal hardtop version called the Monza S (see *Detroit Listening Post* for a picture of the new model).

The fun and spunk of an import—with a few domestic bugs

A nationwide survey based on 197,000 owner-driven miles

by Michael Lamm
WEST COAST EDITOR

What makes people buy Monzas? "I always liked foreign sports cars—their styling, handling, etc.—and finally America has come around." Those are the words of a New York restaurateur. He's got a lot of company in that statement. A lot of people feel the same way.

Styling stands out as the car's No. 1 buying point—no fewer than 78 percent of Monza owners put it at the top of their like list. No one had bought the Monza *despite* its looks; something we find occasionally among buyers of certain imported cars.

Lots of people called the car "sporty." One fellow referred to his Monza as "my little Vette." Another called it "a miniature Z-28," and a third, "poor man's Pantera."

Chevrolet's new Monza comes with an overhead-cam Four as standard equipment—the same aluminum-block engine as in the Vega. But hardly anyone orders the Four. Instead, 97 percent of those in our survey went for the 262-c.i.d. V8. This engine is the same size outside and weighs as much as Chevy's 350-c.i.d. V8, yet it has smaller bore and stroke.

Even with the more powerful V8, very few owners complained of poor gas mileage. The V8, according to those we asked, averages just short of 20 mpg on long trips and 16.4 mpg around town.

(At this writing, the V8 isn't available for sale in California; yet only three percent of our respondents owned Fours. This represented too few replies from four-cylinder owners to tabulate for realistic mileage figures. Also, at the time we sent out our questionnaires, the only transmission Chevrolet offered in V8-engined Monzas was the Turbo Hydra-Matic. So we have no figures or comments on cars with four-speeds.)

What are some of the points owners particularly like about their Monzas? Says a Michigan parts manager, "I owned a Camaro 350, and the Monza feels like a lot more car. It handles better, gets better mileage, and is very comfortable. I also currently own a Vega GT that's nice but no comparison. The company car I drive—a Buick—isn't so comfortable although it's better equipped."

"It's a fantastic automobile," exudes a New Jersey machinist, "... the cornering, the smooth ride and smoother lines, and there's ample front legroom."

An Alabama engineer: "Concerning the gas mileage, on a recent trip to New Orleans, driving 50-60 mph, I consistently got over 22 mpg. We've all heard that the '75s were going to

Low is right—only 4.9 inches at the catalytic converter, so you have to be careful on potholed roads.

It's a mini-ponycar all right, especially with the peppy V8.

Standard rear axle ratio is a long-legged 2.56:1. Chevy listened to all those import owners who complain of buzzy "sawing machine" engines.

She might have a point on those rotten eggs. I got a whiff of them, too!

He likes it better than his Camaro or the company Buick.

Rear passengers gripe about scant headroom due to the sloping roof. But there's a big cargo deck for hauling things.

get better gas mileage, but I never expected this. I think the Chevrolet people should get a well deserved hurrah this time!"

"A nice, longer interval between oil changes and tune-ups, thanks to unleaded gasoline," observes a Michigan dental lab owner, and he's right—it's 7500 and 22,500 miles respectively.

"Handles like a 914 Porsche," comments a North Carolina beautician. "It's low to the road and has lots of V8 power."

Detroit nurse: "Good, secure feeling when driving, quiet inside, terrific body styling, great interior with cloth seats, satisfactory gas mileage. I only wish unleaded gas were more readily available in Canada."

Praises predominated by an overwhelming margin, but as in all cars—especially new ones—there were a few complaints. An Alabama electrical contractor mentioned hard starting on cold days. An Oregon piano salesman grouched, "Lousy workmanship—one week old and the paint's peeling, the taillight is split, the chromed plastic is starting to come off, and the lack of insulation in the roof makes it sound like a tin can in the rain."

"I hate catalytic converters," shrilled a Wisconsin housewife, "because the sulfur dioxide exhaust comes in through the open windows and makes me sick. It smells like rotten eggs. Just think what it's going to smell like when a lot of 1975 cars with catalytic converters get on the road together!"

Chicago bus driver: "Either the doors don't fit right or the rubber weatherstripping is messed up, but there's cold air coming in through the door."

Michigan computer operator: "The fake mag (plastic) wheelcovers fit very poorly and have come off a few times while driving. Also the doors fit poorly at the bottom, so they sound like they're not shut tight."

How about the Monza's comfort? Fully 81.2 percent rated comfort *good to excellent*, and that's high praise indeed for a car of this size. A Florida telephone cable splicer summed it up when he said, "The bucket seats up front are comfortable, but rear legroom and headroom are too cramped." And a Michigan electrician adds, "Comfortable, yes, but the rear seat never gets used; cargo space is used continually."

The Monza drew mild grumbles for less than perfect make-ready. Some 63 percent said they'd had to take their cars back to the dealer for repairs and adjustments. That's an especially high incidence considering how



Four-cylinder engine has plenty of workroom around it. The V8, however, has a problem: One of the eight plugs is almost inaccessible without jacking engine.

The four-speed is presently available with V8-engined Monzas; some owners are now clamoring for a five-speed, soon to be available.

Actually the rectangular headlights give no more light intensity than round sealed beams.

wheels and silence the exhaust." "The car needs a four-speed with the V8." "The standard spare tire cuts down all that cargo room Chevy brags about." "Better brakes, heavy-duty suspension, and more inches from the V8."

Standard appointments were judged good in general, with the tachometer and full set of gauges drawing genuine appreciation. In addition, a college maintenance supervisor confided that, "... the saddle tan vinyl upholstery has fooled a lot of people into thinking it's real leather." "The rectangular headlights give a lot more light," thinks an Indiana trucker.

Most Monza owners are young—in their 20s and early 30s. Many are unmarried or newlyweds, and for 45.1 percent the Monza made up the total family stable of cars. Asked whether they'd buy another Monza next time, 27 percent of our respondents said no. One 18-year-old bank teller from Liverpool, N.Y. said she wasn't sure about buying a Monza next time. "I'll have to see how mine holds up. But I will say this. My father wants one now that he's driven mine." ★★★

short a time these people had owned their cars. Even so, the problems were mostly minor.

Heading the list of mechanical complaints was the carburetor, notably poor performance when cold, plus a high, rough idle. Brakes, too, came in for some gripes. People said the brakes were "squishy" and that the front discs squeaked.

Commenting on the Monza's handling: "Good stability, easy to park in the city with [optional] power steering."—California trucking clerk. "Sports-car-like handling, and a great amount of quickness from the V8."—Indiana soda salesman. "Handling has to be the greatest point. It handles like a car should handle: firm and steady. The power is there, but it's not overpowering."—New York restaurant manager.

And workmanship? Very few frowns here. Nearly 75 percent gave workmanship a rating of *good* to *excellent*. That's right up there with the best.

Dealer service fared less well; 55.5 percent considered it *average* to *poor*, with 22.2 percent saying *very poor* and *terrible*.

We asked Monza owners to suggest improvements, and we got plenty. Here's a smattering: "Needs a lockable compartment under the cargo deck." "Get rid of the 13-inch

These are exactly the same brakes as the Vega's, but the Monza V8 weighs nearly 1000 pounds more.

Skimpy rear legroom and sloping roof relegate the rear seat to short trips, but for small fry it's perfect.



It takes about 13 seconds for the V8 to get the over-3000-pound Monza up to 60 mph

Summary of 1975 Monza 2+2 Owners Reports*

Total miles driven197,676

Average miles per gallon:

Local driving16.4

Long trips19.9

Engine:

2.3-liter Four3.0%

262-cu.-in. V897.0

Transmission:

Automatic100.0%

Why the Monza 2+2?

Styling78.3%

Economy30.4

Size26.1

Handling13.0

Specific likes:

Styling75.8%

Handling49.7

Economy34.8

Comfort30.3

Performance19.7

Ride18.2

Specific dislikes:

Quality of materials11.9

Rattles9.0

Lack of room9.0

Gas mileage9.0

Tire quality9.0

Cold starts7.5

Dealer service7.5

What changes would you like?

More legroom11.3%

Better tires9.7

Styling6.5

Spare tire (type and location)6.5

Number of vehicles owned:

Monza 2+2 only45.1%

Two cars37.4

Three cars11.3

Four or more cars4.2

Other cars owned:

Chevrolet23.7%

Volkswagen15.8

Pontiac13.2

Ford13.2

Comfort opinion:

Good to excellent81.2%

Average to poor17.3

Workmanship opinion:

Good to excellent74.6%

Average to poor25.4

Dealer service opinion:

Good to excellent44.5%

Average to poor55.5

Had any mechanical trouble?

Yes43.2%

No36.6

What type of trouble?

Carburetor20.7%

Brakes20.9

Alignment11.6

Transmission11.6

Did you repair it yourself?

No95.3%

Yes4.7

Dealer repairs satisfactory?

Yes67.5%

No32.5

Age distribution of owners:

15-29 years40.5%

30-49 years26.7

50 plus12.6

Family size:

1-2 people61.4%

3-4 people32.9

5-6 people5.8

Would you buy another Monza 2+2?

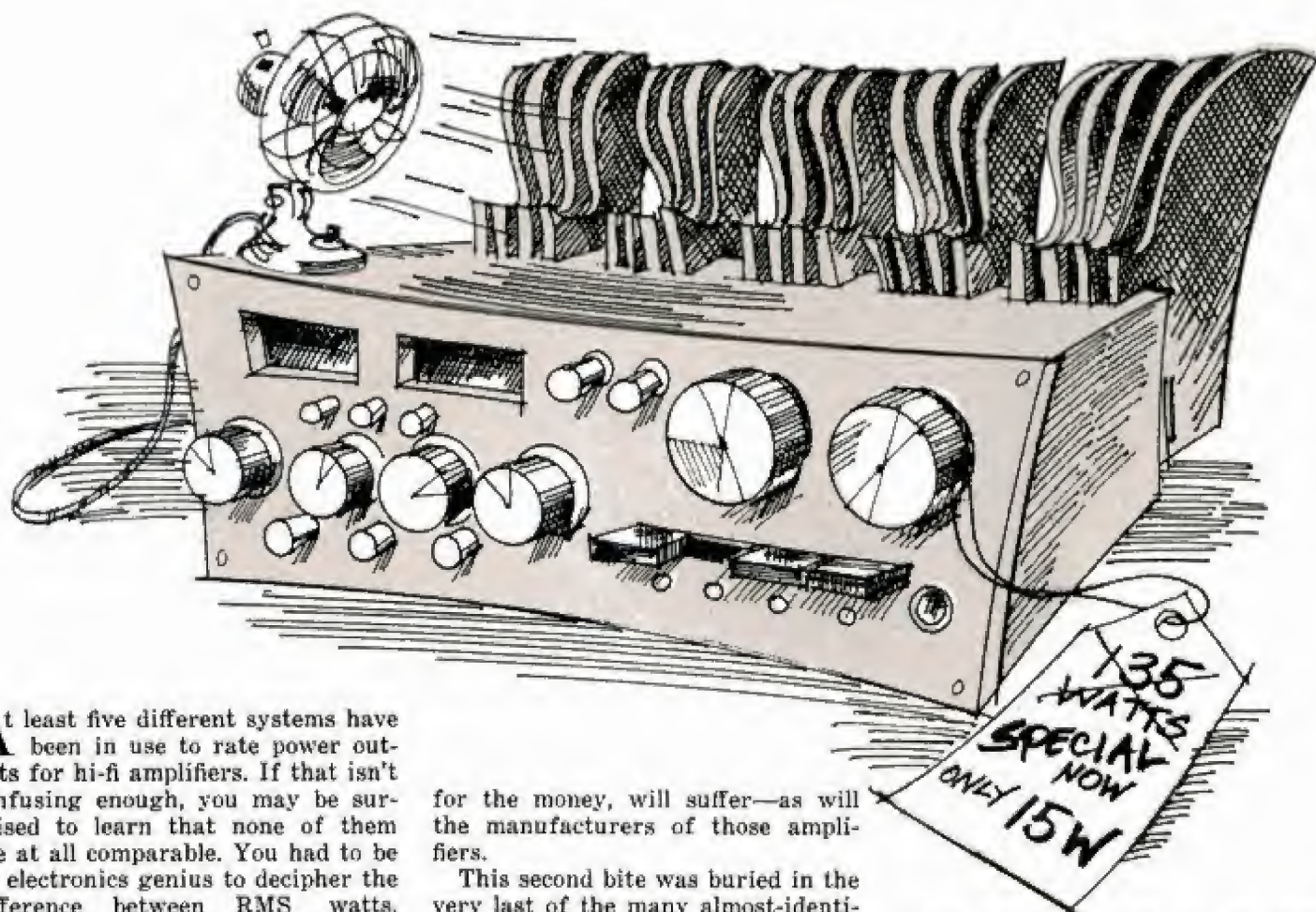
Yes73.0%

No27.0

*Percentages might not equal 100% due to rounding or insufficient data.

The FTC makes amplifiers grow more 'honest'—and more fins

by Ivan Berger
ELECTRONICS EDITOR



At least five different systems have been in use to rate power outputs for hi-fi amplifiers. If that isn't confusing enough, you may be surprised to learn that none of them are at all comparable. You had to be an electronics genius to decipher the difference between RMS watts, music power, peak power, continuous power, IHF watts, IPP watts, watts ± 1 db, and so on.

But now the Federal Trade Commission is changing all that. In a recent crackdown, the FTC ordered that all home amplifiers now be rated by one formula—continuous power or RMS watts—a most stringent rating method.

What does this mean to you? It means that no longer will one manufacturer rate his amplifier at "135 watts" while another, more accurate, maker would rate the same unit at "15 watts per channel."

So the hi-fi buyer is now the beneficiary of a consumerism with teeth in it.

But these teeth, unfortunately, bite in two ways. Those consumers who might formerly have been taken in by the inflated power-rating game will save a lot of money. But others, buying some of the amplifiers that now offer the most legitimate power

for the money, will suffer—as will the manufacturers of those amplifiers.

This second bite was buried in the very last of the many almost-identical drafts of the proposed FTC rule. It looked modest enough: A requirement that amplifiers be run at one-third power for an hour before their power test, presumably to simulate the warm-up they'd get in extended use at home.

But this requirement is not as modest as it looks. One-third power is very close to the point at which today's transistor amplifiers run hottest—hotter, in fact, than they do at full power. Unless some way is found to carry the heat away, an amplifier's output transistors may, if unprotected, cook—or circuits that have been designed to prevent their cooking may shut the amplifier down.

For makers of low-power equipment, this doesn't seem to be a problem. Most such amplifiers and receivers use their chassis as heat sinks to conduct heat away from the transistors. Those chassis are more than big enough to dissipate modest amounts of heat.

But as power goes up, so does heat. That's why medium-power amplifiers sport ruffles of fins on their rear panels, while big amplifiers positively bristle with them. Other methods of dissipating heat are also used: More output transistors, for instance, mean less heat per transistor—and it's the temperature of the transistor, not that of the heat sink, that counts. A few amplifiers even have built-in fans, while one, the Dynakit 400 (page 126, April '74), offers one as an option.

All these cooling measures cost money, but the manufacturers gladly spend enough to take care of the heat of normal operation. They have to—otherwise their amplifiers would come bouncing back to them as fast as flipping flapjacks.

But during that hour of one-third-power operation, the amplifiers will heat up more than they do in normal use. And handling that extra heat

(Please turn to page 144)

Easy riders

The grand touring motorcycles for '75

by Jake Grubb

Big-displacement bikes are coming on strong and becoming more civilized. The machines featured here are the superbikes of cyclo-dom, and range from \$2000 to \$4000. The type of ride you get ranges from soft to sporty, but either way, one you won't forget. Here's a closer look at the big bikes.

BENELLI 750 SEI. Rare to U.S. superhighways, the Benelli 750 Sei is a familiar sight on the Auto-

touring motorcycles. Culminating 52 years' production of Teutonic, twin-cylinder tourers, the R90/S offers a combination of performance, smooth ride and road handling to make it a classic in its own time.

Basic specifications offer a quick perspective: 898 cc, 9.5:1 compression ratio, opposed twin cylinders with 38-mm carburetors, 75 hp at 7300 rpm, five-speed transmission, .924-g braking force, 498 pounds ready to ride. As for comfort and luxury, the R90/S is paramount among all other tourers. Telescopic



Ducati 750 Sport, with its clip-on handlebars and racing setup, is for those who want to do their touring stretched out prone! Engine is a longitudinal V-twin.



BMW R90S is the Mercedes-Benz of motorcycles. Top-of-the-line 900-cc model features a racy touch with streamlined fairing, comprehensive instrument panel.

stradas of suburban Italy. Six-cylinder overhead-cam format with fuel from three carburetors gives the Benelli 76 hp at 9000 rpm.

The Sei is considered by many the smoothest of all European tourers. Power impulses every 120° give a power overlap of 60°, eliminating the effects of inertia at the start of each stroke. Rigid all-tube frame provides low center of gravity, ample ground clearance and light weight for excellent handling. Hydraulic front and rear suspension complements Pirelli "high speed" radial tires for sure road-holding and comfort. All-modular instrumentation is styled for efficiency and modern appearance. *Cosmopolitan Motors, Jacksonville and Meadowbrook Rds., Hatboro, Pa. 19040.*

BMW R90/S. Continued refinement of a proven design supports BMW's long success as a maker of top

front forks with 8-inch travel complement hydraulic rear shock absorbers with soft springs and gentle damping. Together, these provide an ideal ride for the long-distance cyclist.

Dimensions between handlebars, seat and footpegs have been carefully calculated for comfortable posture. The seat is soft, yet resilient, and the fiberglass nose fairing provides additional comfort by cutting drag.

Mounted inside the cowl is an "information explosion" consisting of tachometer, speedometer, trip-meter, voltmeter and electric clock. Also included are colored wink-lights for generator, oil pressure, directional signal, high-beam and brake failure. *Butler & Smith, Inc., Walnut St. and Hudson Ave., Norwood, N.J. 07648.*

DUCATI SPORT. The 750-cc Sport is a bike for high-pressure accelera-



Benelli 750 Sei is powered by a Six—a six-cylinder, overhead-cam engine displacing 750-cc; hp is 76 at 9000 rpm.



Photos: David Gooley

tion and acrobatic cornering. Ducati's newest 750 is a Spartan mixture of hard ride, healthy exhaust note, impressive power and superb handling.

The Sport is racy in appearance with short, low set "clip-on" handlebars, one-man seat, elongated gas tank, nose-fairing and lengthy exhaust megaphones. The unique 90° longitudinal V-engine produces enormous low and mid-range torque with smooth acceleration. Durable five-speed constant-mesh transmission is precise and clunk-free. Cosmetic details such as paint, chrome plating and nameplate decals are abbreviated—if not carelessly applied. Creature conveniences such as electric starting and turn indicators are nonexistent. Handlebar-seat-footpeg layout is

awkward for long-distance touring—effective for riding in short, fast jaunts. *Berliner Motor Corp., Plant Rd. and Railroad St., Hasbrouck Heights, N.J.*

HARLEY-DAVIDSON FLH 1200. The "Harley" is the last of a small handful of motorcycles born in the United States before World War I. Affectionately nicknamed "Harley Hog," the 74-cu.-in. (1200 cc) Harley is perhaps the most classic of all. Having gone through model updates since 1921, the "Hog" exists today in the form of the FLH-1200—the bike most used by law-enforcement agencies in this country.

Despite thousands of improvements built into the engine over the years, the big 45° V-twin has

- 1 **Suzuki RE 5 Rotary** is hot setup for '75. Engine is a two-rotor Wankel.
- 2 **Styling** of 500-pound machine is by world-reknowned designer, Giugiaro.
- 3 **The rotary engine** is water-cooled using a large radiator up front.
- 4 **Automatic electric fan** assists cooling job. It cuts in when necessary.
- 5 **Power comes on strong** with an eerie smoothness; best of all, it's quiet.
- 6 **Instrument pod** or module is cylindrical. It's strange but efficient.

changed little in appearance. It is not uncommon to put 50,000 miles on the big V-twin before major engine maintenance is necessary. The FLH is able to take unusual punishment, as is so well exhibited by the pressures of police service.

About performance, torque is fan-



Harley-Davidson FLH-1200 is the Grand Daddy of all the big touring bikes. The Harley "Hog" sports a 1200-cc V-Twin.



Kawasaki Z-1 is a four-cylinder, 900-cc, double-overhead-cam machine, with positive crankcase ventilation (PCV).

Honda GL-1000 Gold Wing is a breathtaking new bike from the manufacturer that put respectability back in motorcycling.



tastic, but speed leaves something to be desired. The Harley is a chugger: It can climb hills, carry a sidecar or even tow an automobile, but passing performance is poor.

Though operation of the brakes and clutch is smooth, the noise from the transmission and vibration from the engine can be disconcerting at speed—something enthusiasts simply learn to accept. Peculiar features are instruments located on top of the gas tank and a throttle that has no automatic return spring.

Across the country, there are over 650 dealers, at least 2500 working Harley mechanics and a full line of factory-installed options available. It's a convenient tourer for an American to own. But compared with its

newest competitors, it can affectionately be called a living anachronism. *Harley-Davidson Motor Co., 3700 West Juneau Ave., Milwaukee, Wis. 53201.*

HONDA GL-1000. Finally unveiled after two years of rumor, the new GL-1000 carries on Honda's reputation as an innovative contributor to motorcycle touring. The GL has clean lines and a surprising lack of clutter despite its mass. A horizontally opposed four-cylinder engine, similar in appearance to that of a Volkswagen, is placed low and nearly midway within the wheelbase dimensions. This creates a low center of gravity—already the basis for good handling.

What appears to be the gas tank, mounted above the engine, is actually an empty compartment designed for touring gear. Fuel is stored in a tank of deceptively large dimensions located behind the engine. Liquid cooling is incorporated with a compact radiator, mounted in front of the engine between the two main frame downtubes. Power is put to the rear wheel through a compact, low-maintenance shaft drive. Brakes are hydraulic disc-type: twin disc up front, single disc in the rear. Instrumentation is typically Honda: Comprehensive, easy to learn and easy to operate.

Little is yet known of the performance characteristics unique to the GL-1000: At this writing, only

a half-dozen engineering prototypes are in the country. The model will be available at Honda dealers in late spring. *American Honda Motor Co., 100 West Alondra Blvd., Gardena, Calif. 90247.*

KAWASAKI Z-1. The 900-cc Kawasaki Z-1 has comfort, reliability, looks, handling ease, economical gas mileage, simple maintenance and high-performance power—all at a very competitive price.

Norton 850 Commando is sporty model. Interstate 850 version has a huge fuel tank offering greater touring range.



Moto Guzzi 850 T uses the famous V-twin in a freshly restyled bike that's sporty and a practical tourer as well.



The transverse four-cylinder engine has a double-overhead-cam set-up, wet-sump lubrication and fuel intake via four 28-mm Mikuni concentric carburetors. It even has a PCV system. Blow-by gas, normally expelled through the engine breather into the atmosphere, is returned through a system of channels (to separate oil and other elements) to an inlet manifold, through the carburetors and back into the combustion chamber to be reburned. Relatively low compression ratio of 8.5:1 lets the engine run with full efficiency on low-lead gasoline, and Z-1 gets a dependable 45 miles per gallon.

Noise level at 82 dBA is below that of current federal standards. Double-cradle tube steel frame of thick-walled 1.26-inch-diameter tubing insures against flexing under riding stress. Competition-bred chassis design and construction make the Z-1 stable and predictable. Suspension is comfortable but firm—less cushy than some tourers but more suited to a wide variety of riding styles. Large-diameter brakes—hydraulic disc in the front and drum in the rear—make for safe, effective

stopping. *Kawasaki Motors Corp., 1062 McGaw Ave., Santa Ana, Calif. 92705.*

LAVERDA 1000-cc DOHC. Laverda is a name synonymous with motorcycle endurance competition throughout Europe. Though not unknown in the United States, the fabulous Laverda 1000-cc DOHC triple is only beginning to gain proper recognition. With double overhead camshafts and a light alloy cylinder head,

the 1000-cc engine has a 9:1 compression and develops over 80 bhp at 7300 rpm. A buttery-smooth five-speed gearbox offers ratios that comply with a wide variety of road conditions. The engine-gearbox unit is carried in a light but rigid double-cradle frame.

Ceriani telescopic forks with 280-mm twin disc brakes up front complement Ceriani shock absorbers and a large twin-shoe drum brake on the rear. This combination provides first-class ride and stopping power. Handling is sensitive but stable. Replacement parts and service centers are not plentiful for this rare machine. The Laverda is mystique as much as it is motorcycle. *Continental Motorcycles, Inc., 150 Ludlow Ave., Northvale, N.J. 07647.*

MOTO GUZZI 850T. The mere sight of a Moto Guzzi conjures thoughts of luxurious cruising to exotic destinations. Factory designers have taken the best technical features of the bearlike touring models which have made Guzzi a long-distance champion and combined them with the chassis and suspension of the V7 Sport to create the new 850T. An 850-cc, 90° transverse V-twin engine produces 68 hp at 7000 rpm. Power is transmitted to the rear wheel by a high-tensile steel driveshaft through a constant-velocity U-joint system. It's safer, surer and more durable than a common chain drive—also maintenance-free.

The Guzzi takes some getting used to. Quick acceleration must be attempted carefully, since it brings on

an instant torque reaction from the V-twin that tends to make the bike lean sideways. It is a characteristic of opposed twin-cylinder engines, however, something to which owners become accustomed. Once under way, sideways quaking smooths out, as does low rpm vibration from the long-stroke pushrod powerplant. Highway cruising becomes ultra-smooth and comfortable. Soft suspension with firm damping plus a low profile, rigid cradle frame make for excellent handling. Sound is low-pitched, quiet; stopping power, sensitive and secure. *Premier Motor Corp., Railroad and Plant Rds., Hasbrouck Heights, N.J. 07604.*

MV AGUSTA GT. Steeped in the rich tradition of European Grand Prix road racing, the MV Agusta GT is certainly the most exotic and exclusive tourer in motorcycling. The four-cylinder MVGT is a direct derivative of the 500-cc factory racer that has carried Italian riders to repeated world championships since the early 1950s.



Yamaha XS 650B gets power from a single overhead-cam, vertical-twin, four-stroke engine; you get 46 hp at 7000 rpm.

Each MV is hand-built at the factory. Engine cases are of sand-cast aluminum. Each of four cylinders is fueled with a concentric carburetor tuned so precisely that the engine needs no choke. Telescopic front suspension is by Ceriani; enormous double-disc front brakes by Scarab. The chassis, heavily gusseted for strength and yet lightweight for good handling, are carefully built, one at a time. Special cylinder heads with double overhead cams and four valves per cylinder play a large part in the MV's 80-hp muscle.

At nearly \$5000, the MVGT is not only the most exotic but also the most expensive tourer known to motorcycling. *Christopher Garville,*

(Please turn to page 126)



The shop that became a family fun center

Multipurpose hobby room is most-used in the house

by Harry Wicks WORKSHOP EDITOR

Though an avid workshopper, when David Warren of northern Illinois recently wanted to do something with his basement, he decided against using that space strictly for a workshop. Instead, he wanted a room that the entire family could use and enjoy. The six Warren children agreed enthusiastically, and plan-





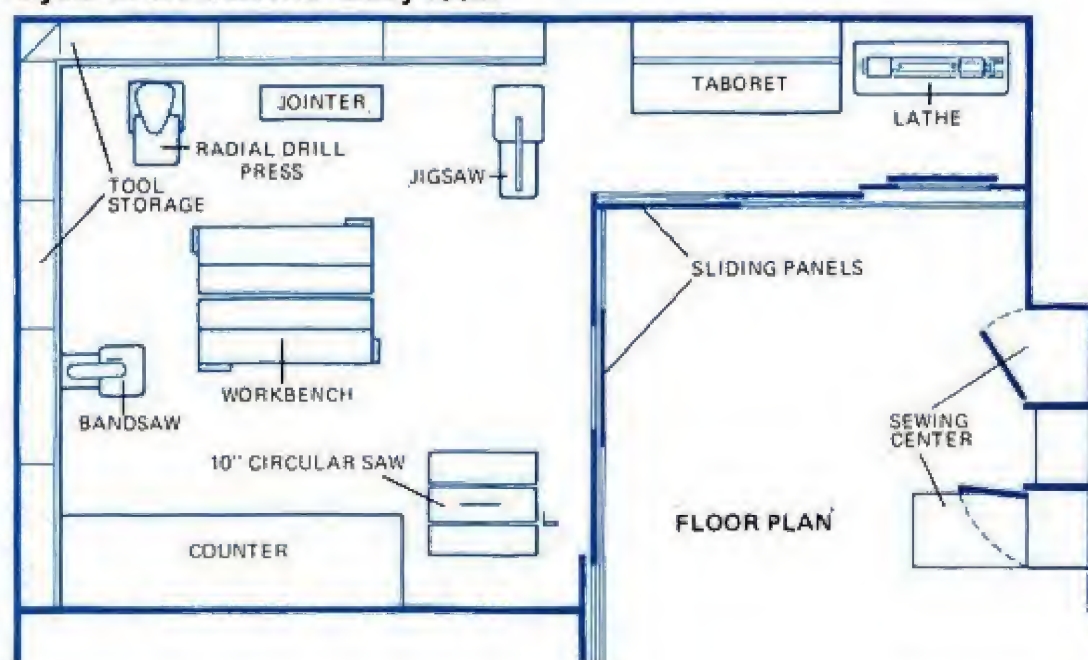
Owners: Mr. and Mrs. David Warren

Color photos: Bill Hedrich, Hedrich-Blessing

Elegant and organized, this hobby center has something for every member of the family. **1.** Work counter features a Corning Counter Saver for soldering and cutting; skylight above gives the room a studio look. The pair of sturdy benches in the center were purchased for less than \$5 at a garage sale. **2.** Barn doors, which separate the shop from the rest of the basement room, slide away to expose a corner that has been set aside for lathe work. **3.** Tools are displayed on Peg-Board, which was installed with a slight backward tilt to prevent tools from falling. Orientation of tools and work center can be seen in the floor plan; because of sliding panels (see photos on next page) the family room can be readied instantly for a party—the workshop is simply hidden from view.



Layout of the Warren's hobby room

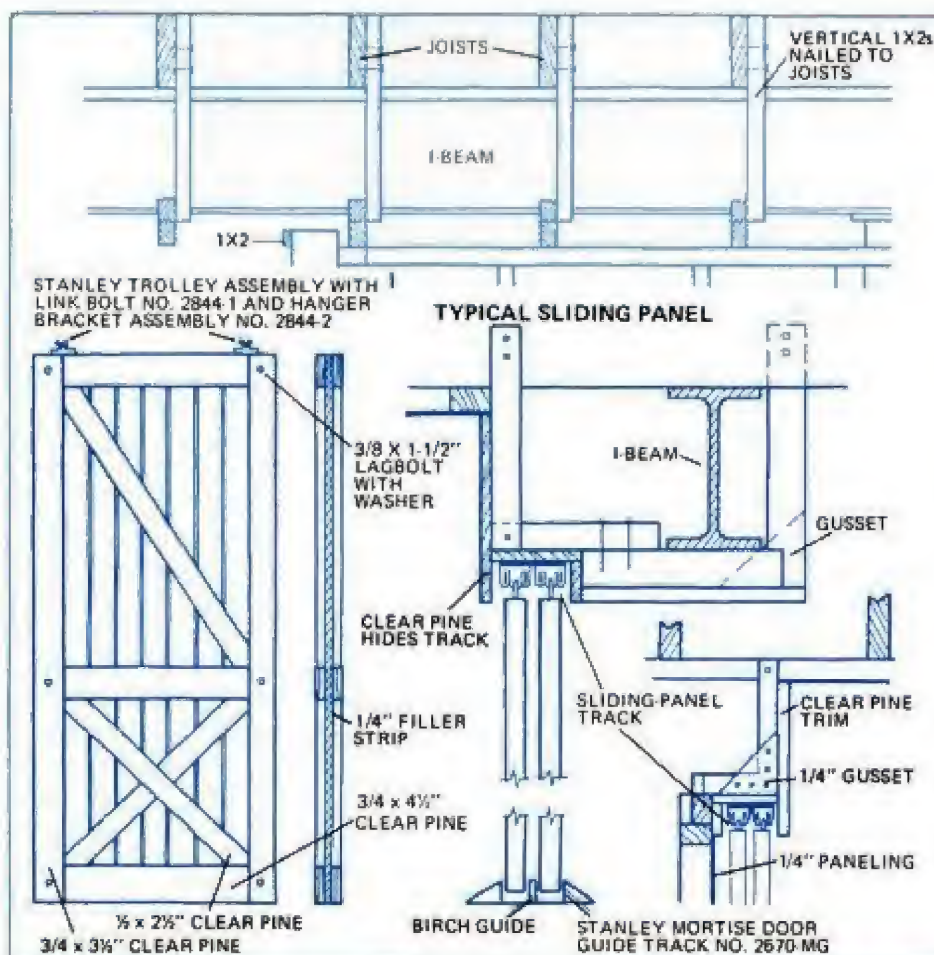




4. Barn doors are shown partially open. When they are closed, the doors meet at the corner (notice track on the floor) to form a right-angle wall that will conceal the shop area. 5. Warren sands bench surfaces; next, he coats the tops with wax for protection. 6. Cutting table in the sewing center swings on a pivot and gets its support from folding legs. When not in use, the table flips up into a closet for out-of-sight storage.

ning commenced on what was to become the most-used room in their house. The need was for a room that could serve several purposes: It had to be a work center all could use to pursue hobbies, special interests and homework projects, plus a family room for entertaining and games. To get what they wanted, Dave came up with the idea of installing a wall of sliding panels which would separate or open up the room as the moment required.

The panels are built to resemble barn doors; each is a full 4 feet wide and as tall as the ceiling height permits. Though originally the Warrens assumed that the rooms would be partitioned off most of the time, Dave says that "it turned out that the doors are almost always open. If one





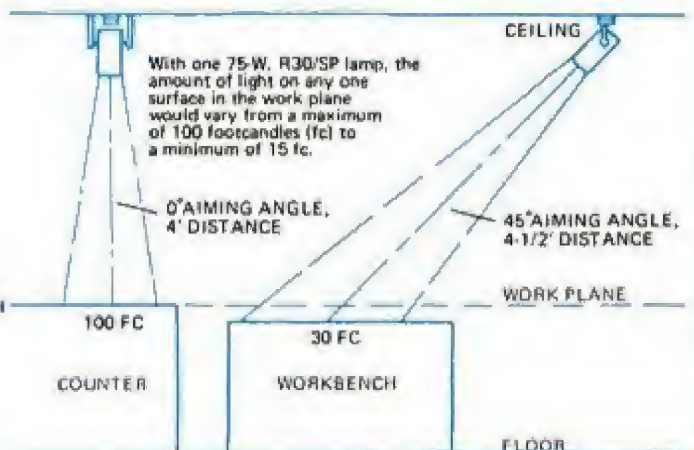
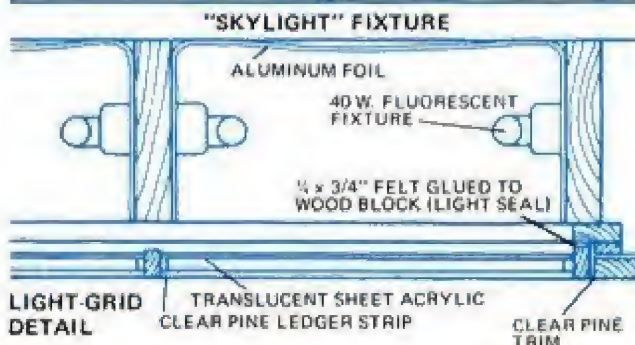
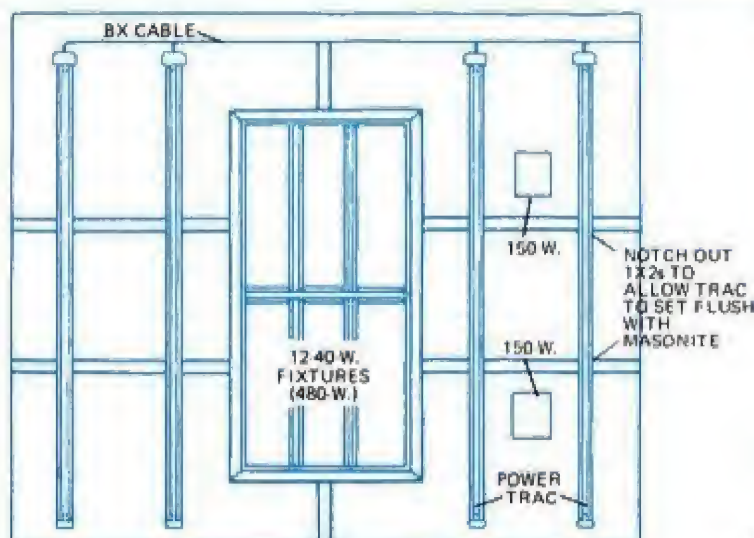
Overall view of sewing center 7. Notice sewing-machine niche in closet at left. **8.** Doors slide easily because they are carefully constructed and mounted on good-quality sliding-door hardware. **9.** Valance over shop work counter conceals roll of photo-background paper. When it's needed for tabletop photography, it's simply pulled down and taped to the counter.

of our teen-agers has a gang over for a rap or rock session, and one of his brothers or sisters is in the shop, the doors are quickly closed to assure privacy for all. But, Dave adds, "lately, the kids and their friends seem to be more interested in workshoping than rapping." He added that "sometimes this place looks busier than the school shop."

For looks, the walls are clad with Masonite's Coach House White hard-board paneling. In the shop area, Peg-Board panels are framed with moldings and painted a bright yellow semigloss enamel.

Perhaps the singular most striking feature in the room is the skylight which Warren created to avoid the dark, cavelike look so common in basement family rooms. For continuity of design, the skylight treatment is repeated on the ceiling in the family room (in which the sewing center is located).

To get this outdoors effect, Dave lined the underside of the subflooring and joist sides with reflective aluminum foil before installing the six pairs of fluorescent fixtures. The light fixtures were then framed as shown below. Translucent sheet-acrylic plastic hides the fixtures but lets the light through; pecan stain on the wood gridwork supplies a touch of elegance. ★★★



POWER-TRAC LIGHTING

Details in the Warren hobby center: Far left: Sliding barn doors were created with paneling which sandwiches 1/4-in.-thick pine fillers. Frames and diagonal bracing are of clear pine finished with pecan oil stain. I-beam was widened by boxing it in with 2x2 stock that, in turn, was covered with 1/4-in. hardboard. Clear pine at the front gives appearance of a beam and serves to hide the track. Near left: Another impressive feature of the basement room is the skylight Warren created using fluorescent lighting; 12 fluorescent fixtures were fastened to joists and concealed using the framing details shown. Above: The skylight is flanked by two pairs of Halo's Power-Trac lights which can be aimed in many directions for maximum efficiency.

Serve your guests with a dash of elegance

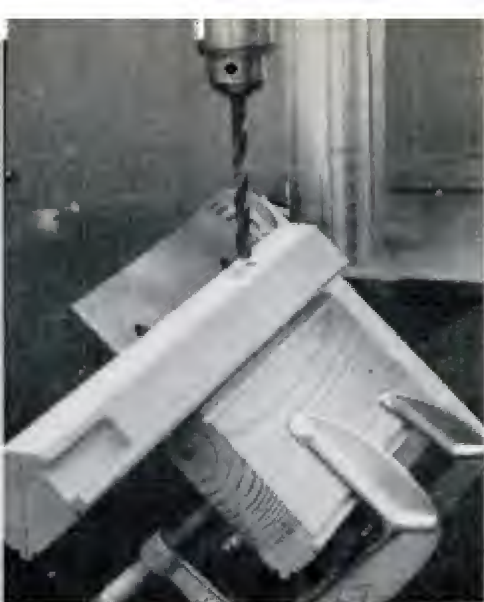
by Rosario Capotosto



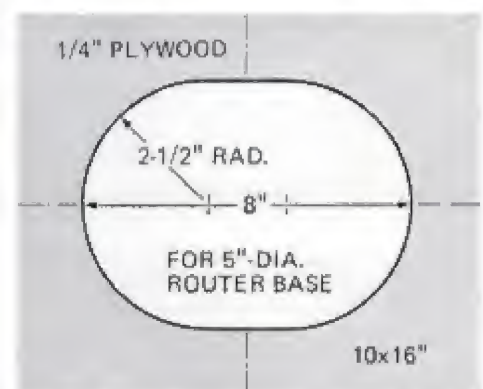
Make this butler's table with a lift-off top, and you'll always be ready to serve coffee or tea to guests. With the top in place, it's a handsome coffee table.



Photo: Stephen Fay



Tilt drill-press table so pencil line on leg and drill bit are vertical, then clamp.

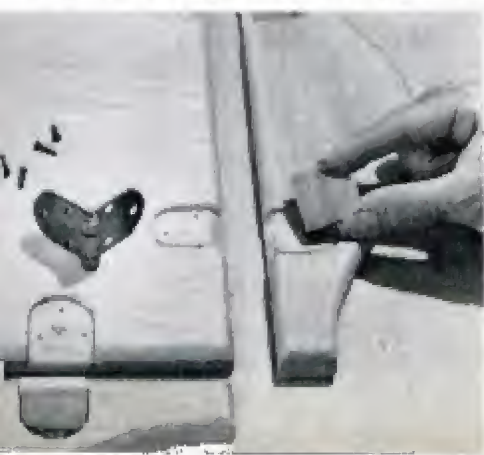


Template forms mortises for both leaves of hinges in one router operation.



Use plywood template to guide router base for cutting semicircular hinge mortises.

Shim hinge mortises in table leaves to make up for single-thickness hinge leaf.



You'll have both a coffee table and a serving tray when you make this attractive butler's table. Its top lifts off for serving, then fits back firmly on the leg assembly when you use it as a table.

Friction hinges let you position its four leaves at any angle from horizontal to vertical to convert it to a tray with built-in handles. Cleats on the underside cleverly position the tray/top on its four legs so it can't slide off.

I made my table smaller than store-bought ones (usually 33x44 in.) for I found the bigger size and greater weight made it impractical for a woman to use the top as a tray.

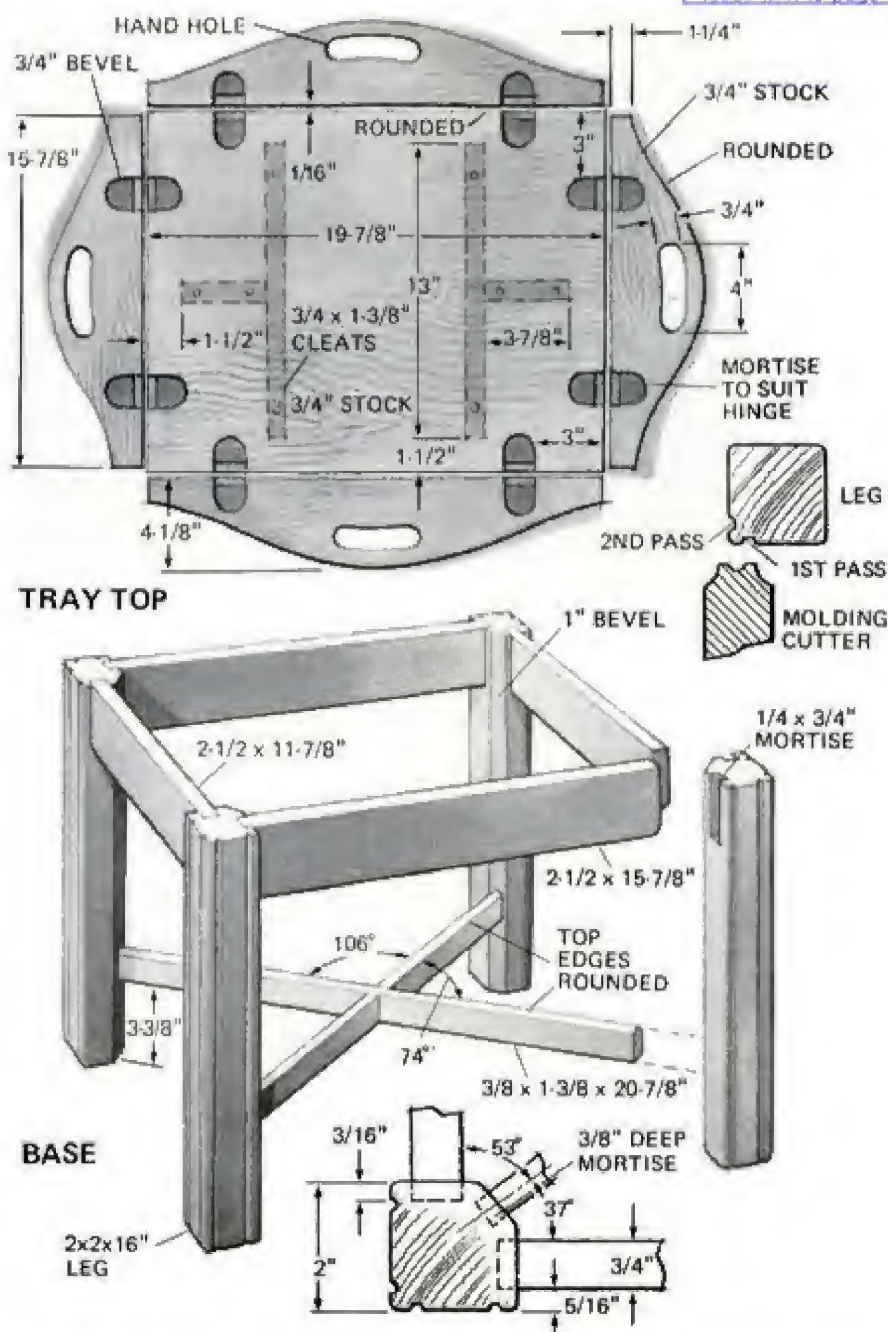
It's no difficult job, but neither is it a hammer-and-saw project. A router will form the semicircular hinge mortises and round the edges. A table saw and molding cutter will form the decorative corner bead-

ing on the legs, a sabre saw will cut the tray leaves and hand grips and a drill press will form the stretcher mortises.

In the drawing below, note that all four legs are made alike; the inner corners are first beveled 45°, then mortised at the top for the aprons and 3 in. up from the bottom for the stretchers. I ripped the leg squares from a glued-up slab consisting of three 3/4 x 12 x 16-in. pieces, then dressed them four sides to 2 in. square.

Since the legs are not set in a square relationship but rather rectangular, the cross stretchers must enter the legs at a corresponding angle. To determine the correct angle for the stretcher mortises, number the legs and stand them upright on a flat surface the proper distance apart. Place a straightedge diagonally across the center of the bevels

(Please turn to page 145)



To buy the best battery, ask what it's going to run

by Rudolph F. Grai and George Whalen



In these days of universal portability, it sometimes seems as if the whole world runs on batteries, all going dead on you at unpredictable intervals—usually when you need them the most.

Why did your portable recorder die just as Junior gurgled his first words? Or why didn't the flashlight in the basement work when the power went off?

Even more baffling is the problem of which replacement batteries to buy: Transistor? Heavy-duty? Alkaline? Mercury? . . . the list is almost endless. One manufacturer alone of-

fers 13 different D-size cells. So which is best?

The answer depends on the kind of use you're going to give the battery you buy. What will it power? How often will you use it, and how long will it be stored before and between uses, and at what temperature? How low can voltage drop before the battery becomes unusable? And which counts most with you: Lowest price, lowest cost per hour of use, or longest time between replacements?

Obviously, there's a lot more to it than just picking a cell of the right

shape and size. But it's not really as complicated as it sounds.

To begin with, there are just four types of batteries in common home use: carbon-zinc, alkaline, mercury and nickel-cadmium, though there are several variations on a few of them.

The carbon-zinc is commonest and cheapest, but not always the most economical. Sometimes called the "Leclanché" cell, after its inventor, it's the standard old flashlight battery—and that's mostly what it's recommended for: flashlights.

Flashlights demand only moderate current, and they're usually used fairly frequently but just for a few minutes at a time. That's a perfect combination for the standard flashlight-type Leclanché cell. If you use your flashlight frequently, you'll wear out the battery long before it runs down by itself, even though its shelf life is poorer than that of most other types (capacity drops about 1 to 1½ percent per month at room temperature, even faster when the temperature is high—but slower at low temperatures, which makes refrigerating unused batteries a good idea).

Short shelf life, by the way, is why the carbon-zinc cells provided with many imported radios, recorders and other gadgets die so soon after you get them. They've already spent months in transit from the battery factory to the radio factory, then across the ocean by ship to a warehouse and on to your store.

A carbon-zinc cell's voltage drops rapidly with use (see chart, next page); but using it a few minutes at a time, you're unlikely to get enough voltage drop to dim your flashlight noticeably—and with the long rest periods typical of flashlight use, your battery will bounce back to full voltage before you use it again.

Heavy-duty or industrial cells have the same basic properties, but are designed for longer continuous use that would soon dim a standard flashlight cell. Though formerly a variety of carbon-zinc, these cells now commonly are zinc-chloride types.

Transistor batteries are also carbon-zinc types, but designed to give extra-long life under the low current drains typical of transistor radios.

Photoflash batteries (a fairly rare type, nowadays) are just the opposite of transistor batteries. While still carbon-zinc, they're built with a large internal contact area so that they can deliver heavy jolts of current fast, for flashbulbs and electronic flash.

Ready for more? *None* of the preceding types are strong performers in any motor-powered device. Unlike lamps and transistors, d.c. motors have voracious appetites for current at start-up and when slowed down under load. Unlike flashguns, they present a continuous drain to the battery. Cassette recorders that stop in mid-reel (or, worse, that slow down, unnoticed, in recording, to make later playback at normal speed sound like the gabbling of a demented duck), motorized toys that gasp to a stop in minutes, and portable shavers that groan through your stubble like a lawnmower in swamp grass are all typical results of using a carbon-zinc battery where another type would operate more efficiently.

The *alkaline* battery (or manganese-alkaline, to give it its full name) is designed for high-drain uses. A cousin of the carbon-zinc cell, the alkaline has a large reserve for peak current demands, making it a good choice for motor-powered applications. It's even better for photoflash use than the carbon-zinc photoflash types—one reason the carbon-zinc photo batteries are so hard to find.

Alkalines are markedly superior to carbon-zincs in other ways, too. In addition to much longer life when used continuously or in high-drain applications, the alkaline recuperates faster when used intermittently, holds its charge nearly twice as well in storage, has a much longer shelf life, works better at low temperatures (though still not as well as at

room temperature), and voltage drop isn't as much in use as that of a carbon-zinc cell.

On the other hand, while alkalines can deliver current at a higher rate than carbon-zincs, they do it at a slightly lower operating voltage; so an alkaline could drive some motorized devices more slowly, though for a longer time than a carbon-zinc.

Though alkalines are less likely to leak when dead, they do tend to "salt" over a long period of time, forming

Alkalines are markedly superior to carbon-zincs in longer life, faster recuperation after use.

a whitish powder at their terminals or, at the least, insulating the cell from whatever it's supposed to power. And the electrolyte paste, if it ever does leak out, is corrosive, too.

While it's good that an alkaline battery's voltage doesn't decline as steadily as that of carbon-zinc cells, the sudden drop in voltage at the end of the battery's useful life can take you by surprise. Carbon-zincs, by contrast, start warning you of their eventual demise almost from the first time you use them.

Alkalines cost more than carbon-zincs—about two or three times as much. If you should use them where the current drain or temperature dictate their use, alkalines are more economical in the long run. But when used in low-current applications such as flashlights or transistor radios, or in intermittent use, they offer little economic advantage over carbon-zincs, and may even cost more per hour of use. Still, if you find frequent

replacement a nuisance, or need to be sure that the batteries you haven't used in some time will still be good when you need them, then alkalines may be worth your while even in applications where their cost per hour is higher.

And it does make sense to try squeezing a bit more life from your alkalines by using them in your transistor radio when they no longer can power your motor-driven portables properly. With some radios, or sufficiently discharged batteries, the sound may be distorted, but with other radios, or only moderately weakened batteries, you may gain a few hours of "free" extra use.

So, while there's no such thing as a universal battery, the alkaline probably comes closest.

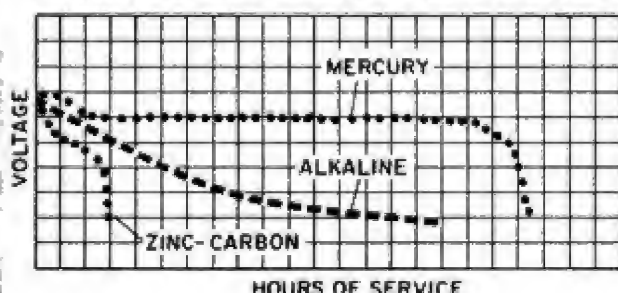
Rechargeable alkalines, chiefly offered by Mallory and RCA, have most of the standard alkalines' advantages—plus rechargeability. This greatly reduces their cost per hour even though they cost about twice as much as regular alkalines (not counting the cost of the special charger, now about \$21).

Alkaline rechargeables cost considerably less than the better-known rechargeable nickel-cadmium types and, while idle, don't lose their charge quite as quickly as nickel-cadmiums do.

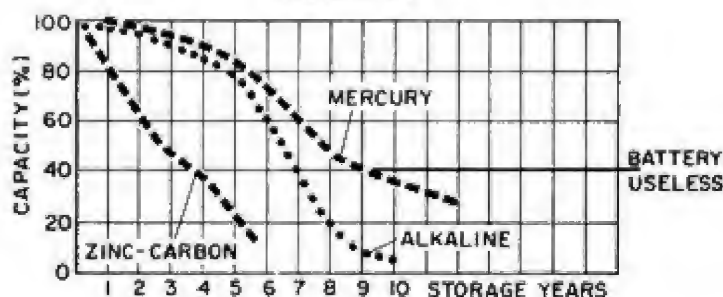
But they can take only about 35 to 60 recharge cycles before failure (far fewer than nickel-cadmiums), and failure will occur much sooner if you drain them too deeply before recharging. Battery authorities suggest recharging before voltage drops below 1.2 volts from its initial 1.5-volt charge. If these batteries are drained until their voltage drops as far as 0.9 volts, they'll suffer irreparably.

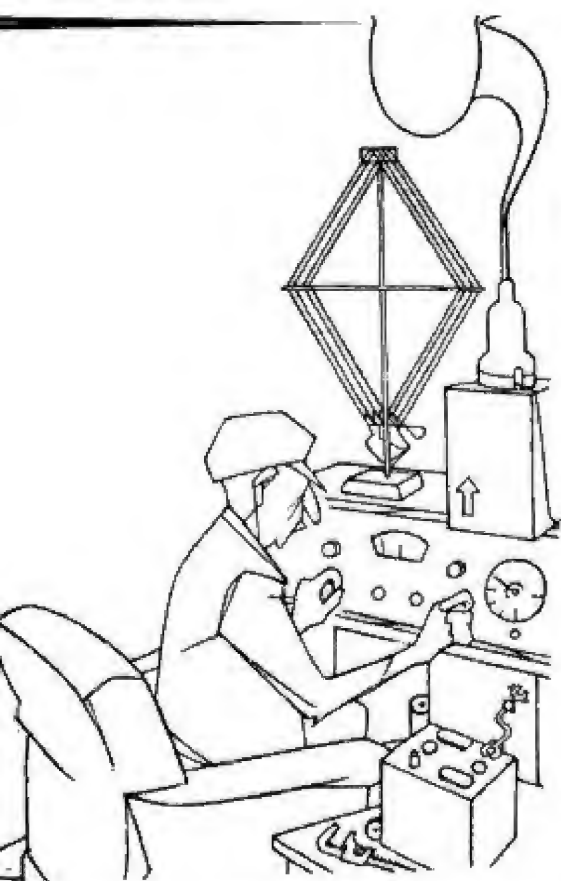
Mallory, for just that reason, doesn't especially encourage home

SERVICE LIFE: 1-1/2 VOLT PENLIGHT CELLS



SHELF-LIFE





use of these rechargeables—most people tend to use them as they do regular flashlight batteries, running them down until they're practically dead, then wondering why they won't recharge back to normal again.

Mercuric oxide batteries—"mercury" cells, for short—cost about two to two-and-one-half times as much as alkalines, and are hard to find in the standard flashlight, penlight or transistor sizes (though they're quite common in the small wafer types used in cameras or hearing aids).

Like alkalines, mercury batteries have a long shelf life with a very low voltage drop, and long life at almost full initial voltage before a sudden voltage drop at the end of their useful lives. But mercury cells outperform alkalines substantially in both these areas (see chart, previous page), enough so that mercury cells are used as voltage references. Besides the great amount of power they pack in a minute space, this is just another reason why the mercury cells are used in camera light-meter systems.

In other ways, though, mercury cells react quite differently. Where alkalines thrive on delivering a lot of power at once, mercuries can take such loads only quite briefly before their efficiency and voltage suffer. Though they bounce back rapidly from brief overloads (even from brief short-circuiting), under normal drains they require no rest and can be discharged continuously with little or no loss of useful capacity.

Though mercury cells work well at high temperatures, their perfor-

mance degrades sharply at low temperatures where alkalines still keep going.

The voltage of mercury cells is constant, though it's lower than that of alkalines or carbon-zinc types: 1.4 or 1.35 volts instead of the standard 1.5. As our graph demonstrates, this difference can be more illusory than real, since the nominal "1.5-volt" batteries quickly drop off to well below the mercury's 1.35 or 1.4-volt level. (The 1.4-volt mercuries also drop off, but just to 1.35 volts; only the 1.35-volt type is used for voltage reference purposes.)

Mercury cells aren't completely interchangeable physically with the standard batteries they resemble. Running slightly smaller than alkaline or carbon-zinc types, they may not make firm (or any) contact in some battery-run devices.

Lithium batteries aren't too likely to show up in the battery bins of your supermarket, hardware store or electronics dealer for a while, but you can expect to see them there eventually. They pack incredible amounts of power for their size—but they cost accordingly. And since they deliver 2.8 volts per cell instead of the 1.5 volts of standard types they're unlikely to become exact replacements for the traditional cylindrical C, D, AA and AAA cells. You're likely to see them first in the same configuration as the familiar 9-volt, snap-contact "transistor" battery. (Strictly speaking, the word "bat-

Nickel-cadmium cells are costly, but in the long run recharging can make them the most economical types.

tery" applies only to units made up of several cells: the 9-volt type, for instance, is made up of 6 cells, delivering 1.5 volts each, in series.) But, like the mercury battery, the lithium "9-volt" size delivers an actual 8.4 volts.

When portable gadgets designed to work on 2.8-volt lithium cells in the standard cylindrical sizes are available, users will have to make doubly sure they replace a lithium cell only with its exact equivalent—devices made for 1.5-volt cells may react quite unfavorably to getting nearly twice the voltage they're designed for.

Nickel-cadmium cells differ in one basic way from most of the battery types we've discussed so far. Instead of being "primary" cells, which generate electricity from chemical ac-

tion nickel-cadmiums ("Nicaid" is not a nickname, but a trademark) store and release electricity just as your car battery does. Initial cost is very high, but if they're properly recharged (and they can be subjected to hundreds of recharges), they can become the most economical batteries of all.

And a well-charged nickel-cadmium battery is a very good battery indeed: It's light, rugged, can take high discharge rates (though with severe reduction of power and capacity if drained critically at low temperatures), holds its voltage fairly constant in use (though the shelf life of its charge is only moderate), and can be used over a wide voltage range (though it's no match for an alkaline cell below freezing).

However, proper recharging is critical. Discharging it below 1.1 volts can reduce the cell's capacity—and so can recharging too soon, before any appreciable amount of power has been drawn from the cell. Overcharging, or charging too fast, can also cause cell damage, though special chargers with complex and expensive circuitry to reduce current as the cell recharges can be used to bring the cell back to full charge in just a few hours rather than the overnight periods simpler chargers require.

Nickel-cadmiums are perfect for emergency, standby power in case the main power-line supply fails. Plugged in to trickle-charge from the power line between uses, they'll maintain full charge almost indefinitely. But where access to power lines or rechargers is limited, nickel-cadmiums, with their short shelf life, per charge, make poor standbys.

Recharging primary cells can't really be done, despite the claims of the companies that sell the chargers. What a primary-cell "recharger" does is actually best called "rejuvenation," bringing back only a portion of the battery's original utility. At best the number of charge/recharge cycles and the capacity per charge is very limited—and then only if the battery is not deeply discharged, is placed on charge very soon after removal from service, is charged with about 1½ times as much as was originally drawn from it, with the charge spread over about 12 to 16 hours, and if it's put back into service quickly, before the rejuvenated cell can discharge itself. That's hardly worth the trouble, considering how little you save.

There are hazards, too: a cell recharged too fast or too long may explode—especially with mercury cells or new alkalines that haven't been recharged yet. ★ ★ ★

How to install a coolant recovery system

It's simply a see-through container that catches overflow from your car radiator. If you have one you take it for granted. If you install it following instructions, you'll wonder how you ever got along without it.

The container is essentially an expansion tank. It is mounted near the radiator and is connected by the radiator overflow hose. It makes a sealed system of your cooling system.

As your engine heats up, expansion takes place in the system and coolant is forced into the tank rather than lost on the road. As your engine cools, temperature and pressure are reduced and coolant is drawn back into the radiator from the tank.

Consider the many advantages:

- You can visually check the coolant level. You don't have to remove the radiator cap and peer inside.
- You eliminate the danger of removing the radiator cap and receiving a possible scalding.
- You save costly antifreeze, now at record high prices.
- A sealed system keeps air out of your cooling system, reducing corrosion, and bubbling that impairs heat transfer.—*Bill Hartford, Automotive Editor*



2. Hose clamps should be used at both ends of the radiator overflow hose. Find the hose, which usually runs down side of the radiator, and free it for next step.

3. Overflow hose is placed over flange on the bottom of the bottle. First slip a clamp over the hose, then slide it down into place to secure the hose.



4. Tighten clamp that holds the overflow hose in place on the bottle. Also tighten clamp on radiator end. Ready sheet-metal screws for the next step.

5. Overflow bottle, with hoses in place, is positioned and secured with sheet-metal screws. When drilling holes for sheet-metal screws don't make them too big.



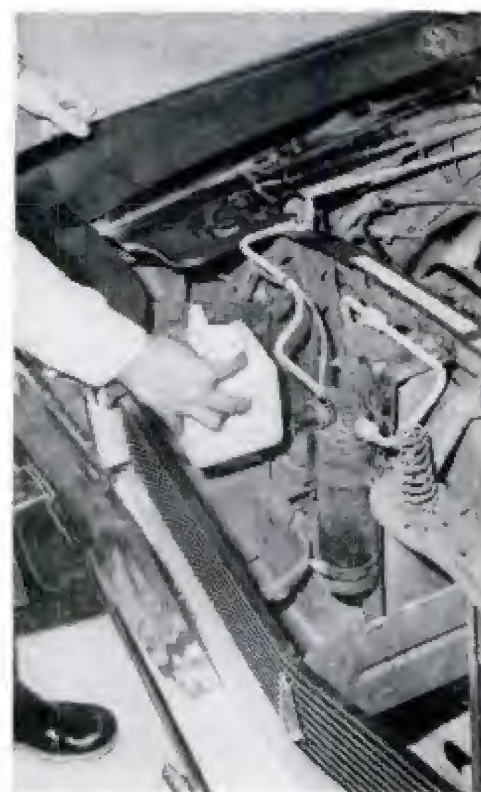
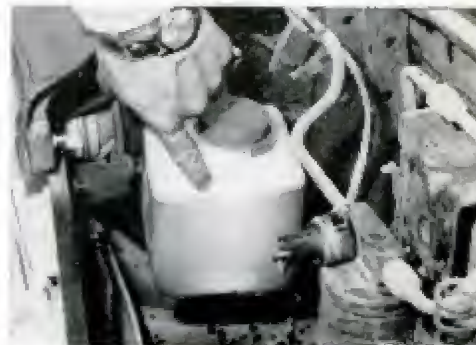
6. Rubber seal on new radiator cap that comes with the overflow bottle is necessary to seal the cooling system. Make sure the rubber seal is in place on the cap.

7. New radiator cap is put in place after radiator is filled to top with a 50/50 mixture of ethylene glycol antifreeze and water. Fill overflow bottle next.



8. Fill the overflow bottle half full with antifreeze, or between the "Min" and "Max" marks if the bottle has these markings on the side. Check level as below.

9. Level will rise as engine warms up. If you've overfilled bottle, remove excess coolant with syringe or a pump of type used with hand lotion or glass cleaner.



1. Overflow bottle, which can be bought in most auto-parts stores, should be mounted high in the engine compartment near the radiator. Find a spot ahead of the radiator, possibly inside a front fender.

IT'S NEW NOW



First look at world's mightiest bomber—the B-1

Surprisingly small for the big job it will do, the much-heralded B-1 bomber makes its first public appearance recently at Wright-Patterson Air Force Base in Ohio. Though only two-thirds the size of the B-52 it replaces, it will carry nearly twice the payload and fly at better than twice the speed of sound. Its variable-sweep "swing" wings retract for high-altitude supersonic flight, extend for low-speed, short-field landings and takeoffs. Expected to be our chief nuclear deterrent for 30 years, the B-1 was jointly developed by Boeing, Rockwell International, GE and Cutler-Hammer.



'Barnyard boat' finally makes it to water

When 65-year-old retired Iowa farmer Bill Bodisch began building a 58-foot yacht in his barnyard, people smiled (see *A Dreamboat Takes Shape in a Barnyard*, page 96, Dec. '74). Now Bodisch has the last laugh. His 22-ton, all-steel cruiser is trailered (left) to the Mississippi River and finally launched (above). Bodisch plans a world-wide voyage.



Simple-to-install filter protects hot-water heater

Easy-to-add water filter not only prevents mineral deposits from forming in your hot-water heater, but even loosens hardened scale already built up in the tank. It dissolves harmful mineral residue that fouls lines and can lead to heater failure. AP400 Lime-Aid Water Conditioner inserts in cold-water inlet and has replaceable filter cartridges you can change without tools. AMF Cuno Div., AMF, Inc., Meriden, Conn.

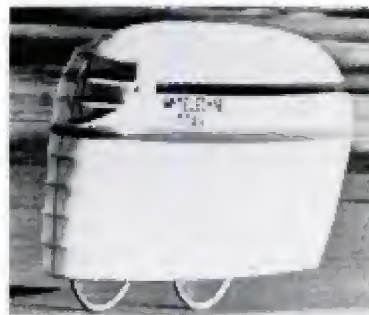


THE LATEST PRODUCTS AND DEVELOPMENTS



**Pretty shark bait
now sharkproof**

When beautiful "Sea Maids" at Florida's Sea World tourist attraction go down to feed fish, they have one problem—sharks like to eat, too. Now this plastic-sided "shark cage" allows spectators to view the feeding while protecting the pretty feeders from any overanxious man-eaters—or girl-eaters—that may be in the area. The cage, of GE's Lexan plastic, has made more than 5000 dives in the past year.



**It may not look like it,
but—yup—it's a bicycle**

Shrouded in a streamlined shell to cut wind resistance, bike racer Ron Skarin sets a new world speed record for two-wheelers at nearly 41 mph for the mile distance. He also hit 43 mph for the 200-meter run. (Bicycles have traveled faster, but only by following a "pace" car.) Bike was designed by Teledyne, shell by Dr. Richard Kyle of California State Long Beach College.



Walking wastebaskets eat trash and like it

Sheep may soon become living wastebaskets. Research in Australia shows the animals can exist on a diet of 60-percent waste paper, greatly reducing the cost of feed as well as providing a handy way to get rid of trash. Photo at left, above, is a gag shot—the sheep don't eat the paper "raw." It's ground up with minerals and other nutrients and formed into pellets (right), which then become fodder.



World's biggest piggyback ride!

Riding piggyback-style, a prototype of our Space Shuttle Orbiter gets a lift on top of a Boeing 747 jetliner in this artist's concept showing how the two will fly together during prelimi-

nary shuttle flight tests. NASA space technicians will use the jumbo jet to simulate landing approaches with the Orbiter and also to transport the shuttle from one NASA base to another.

Movie camera's built-in titler lets you zoom through slides

A unique "optical bypass" system on this new Elmo Super 204T super-8 movie camera lets you superimpose close-ups of title slides with live action—and get as close as the front of the lens without blocking subject illumination. The accessory slide-holding titler fits a special shoe on the camera. Lens is an 8.5-34-mm, $f/1.8$ zoom. Other features include a shutter release that folds out of the way when not in use, preventing accidental exposure, and an exposure compensation button for backlighting. Elmo, 32-10 57th St., Woodside, N.Y. 11377.



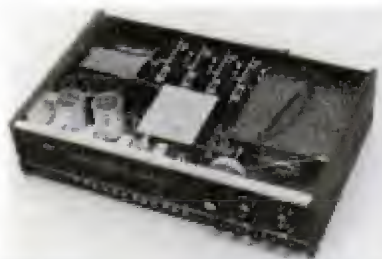
Speed ratchet for electric drills

Accepting standard-drive sockets and screwdriver attachments, Tight-N-Fast fits into any $\frac{3}{8}$ or $\frac{1}{2}$ -inch portable electric drill chuck to lighten bolts, nuts, drive screws. It has adjustable torque feature to prevent thread stripping and head shearing. With magnetic sockets, sheet-metal screws can be seated without starter holes. \$19.95 postpaid from Nebraska Machine Products, Box 12214, Omaha, Neb. 68112.



Well, it's one way to cross a river

Proving that a motorcycle can go just about anywhere, Greg Rodda of South Perth, Australia, emerges from the Canning River after crossing it underwater. Long "snorkel" tubes connected to the cycle's exhaust and carburetor intake kept the engine breathing, while scuba gear did the same for the watery rider.



Kit-built four-channel receiver

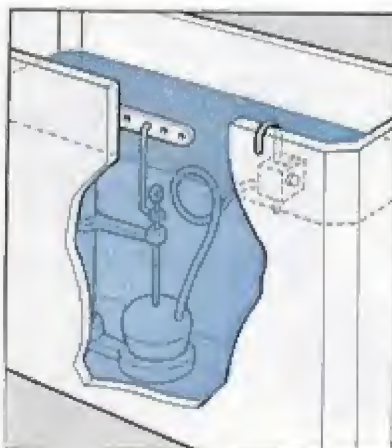


It took us 32 hours to build this Heath 15-watt-per-channel, quadraphonic, FM/AM receiver. It was basically easy, except for a few too-short wires and a knuckle-busting transformer installation. Performance is good, controls convenient, and we liked such details as the deep-finned speaker terminals (left) that prevent shorting. The Heathkit AR-2020 receiver kit is \$260; an amplifier-only version is \$200.



Studio-type mike mixer comes in a kit

Gately, maker of the first professional microphone mixer kit (see *Homebuilt Kits for 'Professional' Recording*, page 136, Aug. '74), now has a second model. The Prokit II has slider input controls, front-panel switches for bass roll-off and mike gain, panpots to "place" any mike wherever desired between the two channels and LED indicators that flash when a pre-selected overload is reached. Kit, \$589; wired, \$889.



Water-saver for toilet tanks gives you flush choice: Full or half

To cut water use in toilets, Dual Flush System lets you flush bowl with half-tank of water for liquid waste, full tank for solid. Air valve (cube) lets ball reset after half-tank is discharged; handle is held down for full flush. Device is \$4.98 postpaid from Savway Co., 52 Copley St., Staten Island, N.Y. 10314.



Look, Ma, no boat—a robot tow for water skiers

You don't need a towboat to water-ski with this remotely controlled robot to pull you. The 6-foot-long fiberglass mini hull has a 40-hp jet drive capable of better than 30 mph. Start, stop, throttle and steering are all controlled by skier through a 35-foot cable containing electrical and hydraulic connections. Called Ski-Whee, it fits in a station wagon, is said to eliminate cost of ski boat and trailer, plus need for a crew. About \$1300 from Ski-Whee Distributors, Inc., 1841 Wambolt St., Jacksonville, Fla. 32202.



New high-speed train may rival air travel

Striking along at up to 120 mph, this sleek Canadian-designed express may be the answer to high-speed rail transportation between cities, making it possible for trains to compete with airliners on some routes. Called the LRC (for Lightweight Rapid Comfort), the diesel-electric-powered train uses a system of centrifugal-force sensors that provide automatic banking on curves to maintain comfort and safety at high speeds.

Gas-saving street buggy gives good speed, mileage

You get 55 miles to the gallon and speeds up to 50 mph in this trimly styled three-wheeler. Street-legal, the Exalter sports a 12-hp Tecumseh engine with electric start, independent front and rear suspension, disc brakes and all accessories required for road operation. Models range from \$439 to \$1299. Owosso Explorer Corp., Box 177, Owosso, Mich. 48867.





New calculators: One doesn't just calculate, it almost schemes

Sharp's PC-1002 scientific calculator (left) takes plug-in, integrated-circuit programs of 256 steps each, controlled by four special keys, and can be temporarily programmed for up to 64 steps through the keyboard. Statistical, math, metric and surveying plug-ins and others to come cost \$75; custom programs will also be available. The PC-1002, with one plug-in, is \$645. Canon's latest (right) is a large-type portable printing calculator with percentage key, \$160.

Lossless lens cap makes photographers flip

Tired of the old "Is-my-lens-cap-in-my-pocket-or-did-I-lose-it-in-the-long-grass" blues? This lens cap flips open and shut, so you can't lose it. Available so far for lenses with 55-mm front threads, it's \$5; combined with a lens hood, \$6. Have your photo dealer order it from Kalt, Santa Monica, Calif. 90404.



Sensuous shower head: Get a massage while you bathe

Take the Intermittent-spray principle of a Water Pik, put it in a shower head and you have Shower Massage that lets you dial fast or slow pulsed spray, plain spray or a combination. Idea is to clean thoroughly while giving you a pleasant sensation—in fixed or hose models. Teledyne Aquatec, 1730 East Prospect St., Fort Collins, Colo. 80521.



Bike lock comes with own pouch

All-Safe bike lock stores in its own saddle-mounted pouch when not in use, has 5-foot, 3500-pound-test, vinyl-coated aircraft cable. Pouch has reflective Scotch-lite strip. Suggested retail price is \$8.95 at bike shops, hardware stores. Clyde T. Johnson Associates, Lock Div., 520 South 15th St., Escanaba, Mich. 49829.



Man, when this thing dumps, look out!

So big it makes a regular truck look like a toy, this monster dump truck, said to be the world's largest, is 67 feet long and 25½ feet wide, can carry more than 350 tons and is powered by a 3300-hp locomotive engine. Called the Terex Titan, it was developed by General Motors to haul ore at mining sites.



Diving helmet—new fun from an old idea

With this simple plastic diving helmet, you can enjoy underwater fun without costly scuba gear. Aqua Bell comes with 35 feet of air hose and can be operated with hand pump or small compressor. Helmet, \$49.95; pumps, \$10.95 to \$109.95. Aqua Bell Corp., Box 221, Windsor, Wis. 53598.



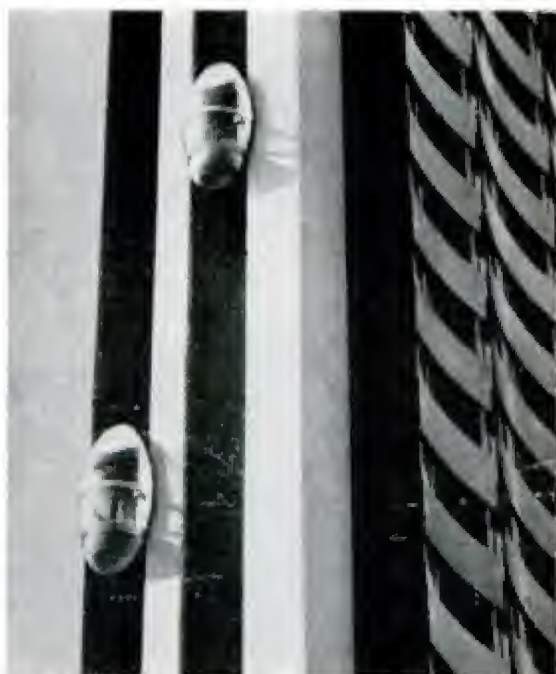
Convertible caddy is dolly and hand truck, too

All-steel folding caddy stores in 6 x 16 x 18-inch space, has adjustable handle, solid-rubber ball-bearing wheels, 250-lb. capacity. Wingnuts lock caddy in shape desired. \$39.95; \$42.95 with swivel wheels. Caryall Products Co., Box 35072, Normandale Branch, Minneapolis, Minn. 55435.



Deluxe changer with turntable quality

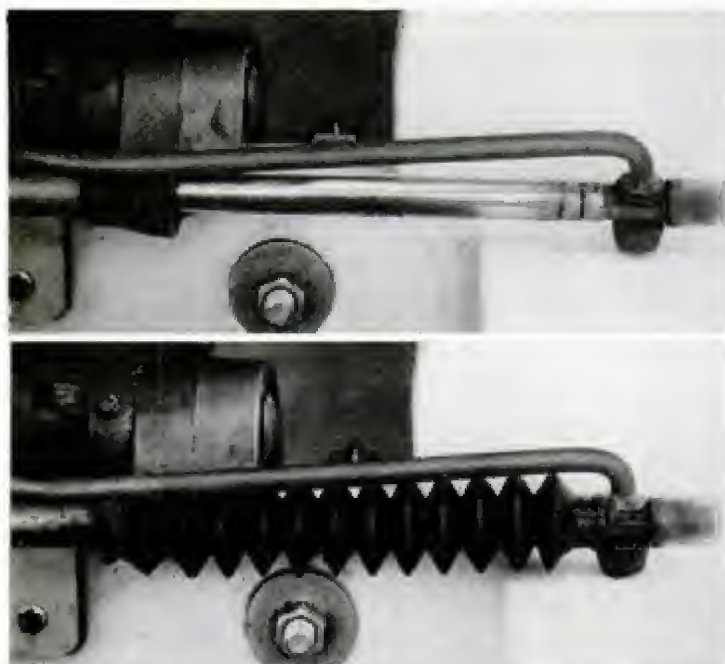
If \$349.95 seems a lot to pay for a record changer, this Technics by Panasonic offers a lot. It represents the first application of the company's direct-drive turntable to an automatic changer for minimum distortion. A built-in strobe lamp permits precise checking and adjusting of speeds. The SL-1350 takes 4-channel CD-4 cartridges, also functions as a single-play turntable.



The view's fine—but don't look down

Looking like giant raindrops, these streamlined transparent elevators scoot up and down the outside of a new 23-story hotel near Paris. Designed by Ascinter Otis, French affiliate of the U.S. Otis Elevator Co., the see-through cars save valuable interior space and give passengers a spectacular view of the countryside to boot—so long as you're not squeamish about heights.

Seven tips for better boating



Slicker steering

Boats weren't built to travel on land, but many do behind a car. The dust and grime collected while trailing down a dirt road to a fishing hole can join up with salt spray to freeze up your steering. But the exposed shaft (top) can be easily covered with a corrugated rubber sleeve: Ford P/S Kit C60Z-3C651-A, from your auto parts store for just over a dollar. Install sleeve as shown.

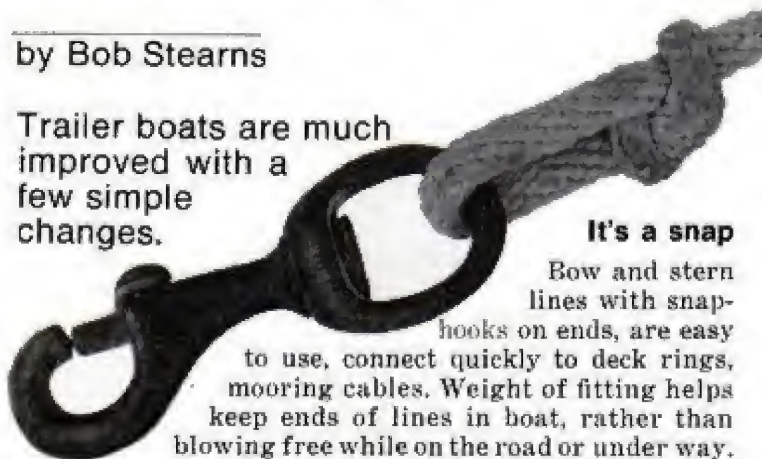


Sparkle plenty

Night travel, afloat and (particularly) ashore, requires good visibility that can be helped with applications of reflectorized tape. The powerhead of the outboard motor above, wrapped with a strip of tape, helps show the overall length of your car-plus-trailer rig, especially when the trailer's taillights are not visible from the side. Spot-wrap the trailer frame as well.

by Bob Stearns

Trailer boats are much improved with a few simple changes.



It's a snap

Bow and stern lines with snap-hooks on ends, are easy to use, connect quickly to deck rings, mooring cables. Weight of fitting helps keep ends of lines in boat, rather than blowing free while on the road or under way.



Under wraps

Vinyl tubing is particularly easy to install on a length of line that may chafe on a coaming or through a chock. A stopknot of light line, as shown, can hold it in place, or it may be left free to slide into the best position. For heavier anchor rodes and mooring lines, garden hose can be cut in a spiral, rewound on line—which makes chafing gear that's easy to remove.



In the clear

From a heavy sheet of clear plastic, a number of protective covers and flaps can be cut. The tab above, useful to keep spray and rain out of an ignition switch, was secured by loosening the panel's mounting screws, sliding the top of the plastic under the panel, then tightening screws. Along the bottom, splitshot sinkers are crimped on to weight it down over the instruments.



Shock treatment

The many uses of elastic shock cord are no secret to boatmen, but there are always additional ones. A locker lid that rattles and blows open can be secured with a shock cord and a wire loop that fits over a screw in the lid's edge. Lower screw holds loop in place when it's unhooked.



Standing the gaff

When you need a gaff, boat hook, fender or paddle, you need it now—and in place rather than under foot or in a locker. Small shock-cord loops can hold cockpit essentials ready and waiting, and also anchor down batteries, rods, binoculars, radio and other gear.



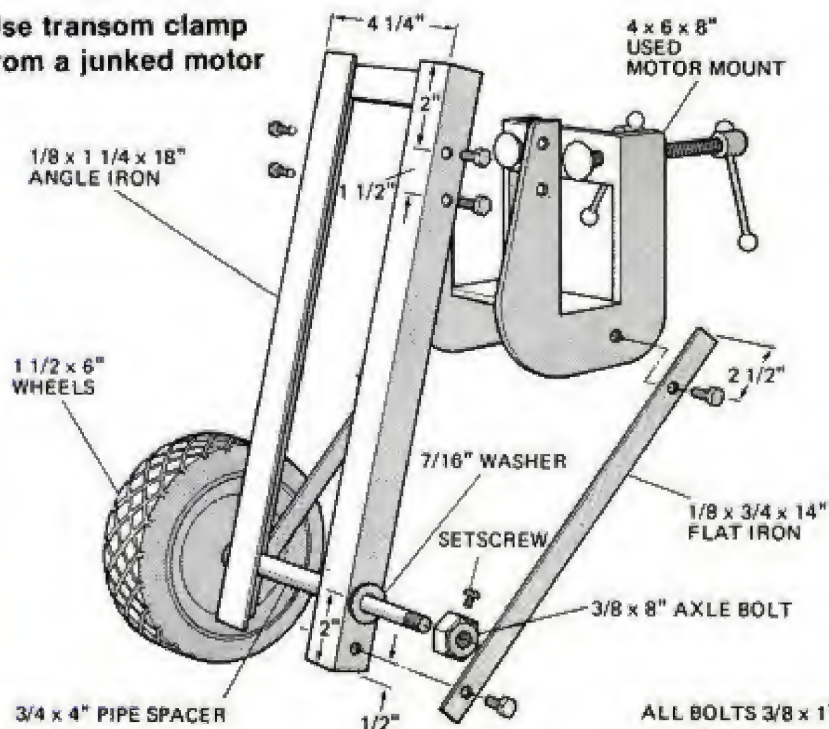
Roller tote for launching



You can buy a ready-made lightweight rig like this with thin doll-carriage wheels for \$20 and up, or use the transom clamp from a junked outboard motor and build a really sturdy tote of your own for half the price. This mini-dolly makes it possible for you to single-hand fishing boats of up to 200 pounds.

Wheels are the most important parts. They should be of the ball-bearing type, $1\frac{1}{2}$ x 6-inch with treaded rubber tires and should cost less than \$2 each. Use four, two on each side, for sandy soil, and a 12-inch-axle bolt instead of an 8. Other materials include one 4-inch length of $\frac{3}{4}$ -inch gas pipe, one 36-inch length of $\frac{1}{8}$ x $1\frac{1}{4}$ -inch angle iron and the same length of $\frac{1}{8}$ x $\frac{3}{4}$ -inch flat iron (these you will cut in half), eight $\frac{3}{8}$ x 1-inch bolts, two 7/16-inch washers. Assemble as shown and spray with a rust-resistant paint.—John Aaron

Use transom clamp from a junked motor



Service your own ignition system—and save up to \$40

by Mort Schultz

Ignition system tune-up includes replacing sparkplugs, reconditioning the distributor and setting dwell and timing. This service is essential to avoid problems such as hard starting, missing and excessive fuel consumption.

Done professionally, the cost would be \$40 to \$60 for an eight-cylinder engine. Done by you, the savings will be \$20 to \$40.

Parts and labor

Here's a specific example: A Buick dealer told me that he now charges \$29 for parts and \$30 for labor—a staggering total of \$59. Someone servicing his Buick himself would have to spend only \$23 for parts.

The owner would save \$36 just by doing about one hour's worth of work.

Costs can be cut even more by shopping for parts. The prices I've given have been for GM replacement parts, but you don't have to use those bearing a car manufacturer's name. Good quality parts are manufactured by many reputable independent companies.

Another way to save money is to

buy your parts from discount stores.

Instruments and tools

The cost of the very first service you do will probably be higher than succeeding services, because you may have to buy instruments you don't have. You will need a timing light, dwellmeter/tachometer, feeler gauge set, sparkplug gapping tool, distributor-tower brush, distributor-point file, distributor wrench and sparkplug wrench.

Cost of these tools, though, is a one-shot deal that will be written off with each service you perform.

With the exception of the dwellmeter, feeler gauge and distributor-point file, which are not needed for servicing electronic ignition systems, the tools I've listed are required for servicing both electronic and conventional systems.

Basically, conventional ignition systems use contact points and condensers, while electronic ignitions don't. This article concerns conventional ignition service; next month we'll discuss electronic systems.

Follow the numbers

Here is the essential procedure,

by the numbers on how to service a conventional ignition system:

1 After cleaning and regapping sparkplugs (or replacing them if they are badly worn or damaged), wipe off the coil and examine it. If the case is cracked, replace the coil.

Replace primary circuit wires if insulation is frayed or cracked, making sure they are attached tightly to terminals.

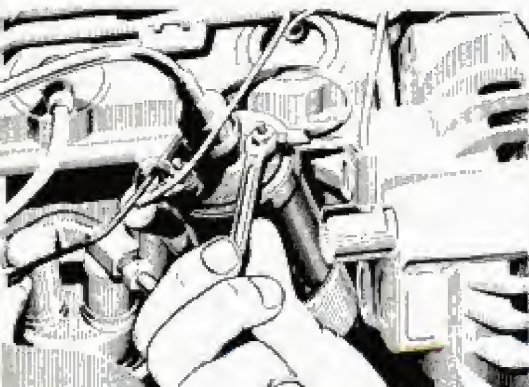
Remove the secondary cable from the coil tower by twisting and pulling the boot—not the cable. Replace a cable having damaged insulation or a badly eroded terminal.

Clean out the coil tower with the distributor-tower brush and reseal the secondary cable firmly.

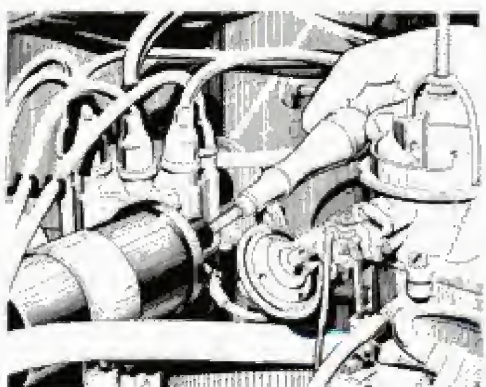
2 Disconnect the coil-to-distributor secondary cable at the distributor. Uncover the metal terminal and hold it $\frac{1}{4}$ inch from a clean ground on the engine. Use a clip-type wooden clothespin clipped to the cable to hold the cable during the following test. Don't grasp the cable itself. You may get a shock.

If the terminal is covered by a molded-on boot that can't be pulled

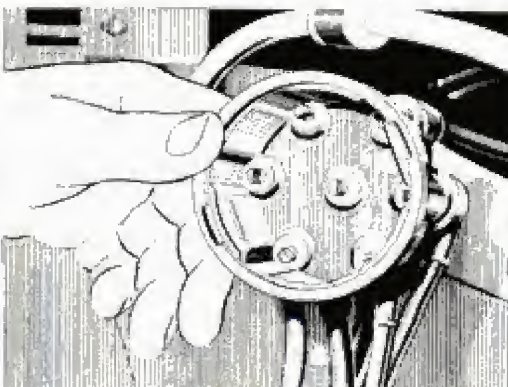
Ignition wires in the primary circuit should be checked carefully to see if they're attached tightly to the terminals on the coil. Also check to make certain that the insulation is sound.



Coil tower and distributor tower should be checked for cleanliness. They should be free of deposits. To clean them, use a professional distributor-tower brush or improvise a tool to do the job.

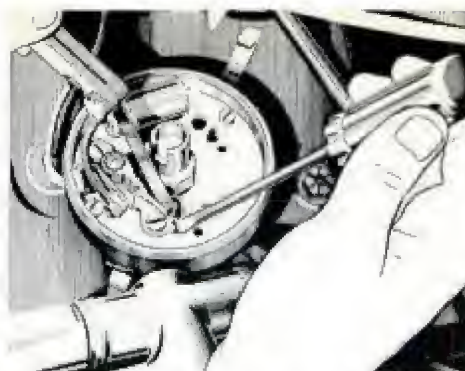


Distributor cap is removed for ignition service and the inside of it is too often overlooked. Check for damage and deposits, and wipe it clean. Internal damage can cause hard starting and missing.

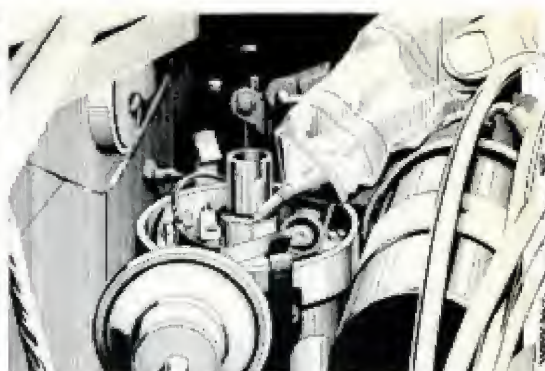




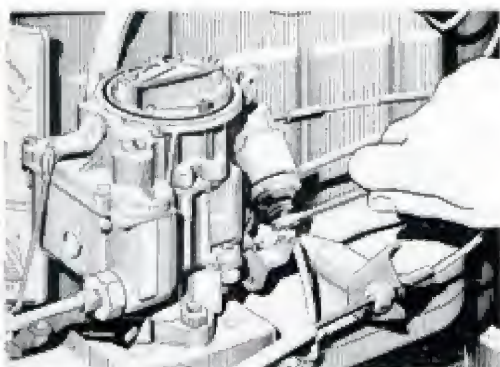
Distributor rotor conducts high current from the coil to sparkplug wires. Inspect it carefully, and always carry a spare.



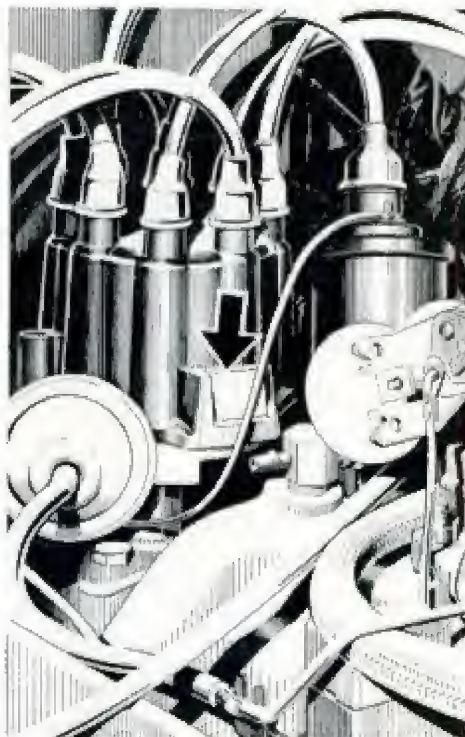
Distributor points are adjusted in a variety of ways. You can adjust this set by twisting a slot near mounting screw.



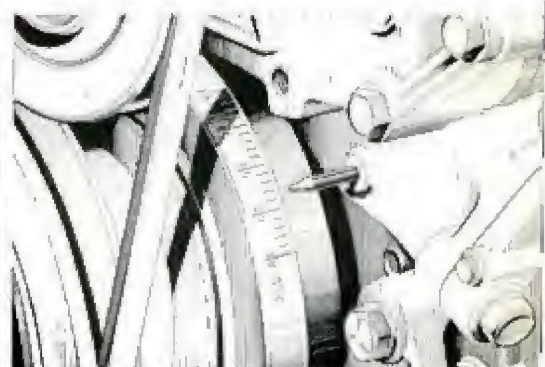
Cam lobe lubrication requires a steady hand: Place one drop on one cam lobe only. Take care not to overlubricate.



Slow idle speed should be set at the carburetor before you set the dwell angle at the distributor. Here, this is done at the idle-stop solenoid.



Dwell angle on some cars can be set without removing the distributor top. You open an access door and insert an Allen wrench to make this adjustment.



Timing mark and pointer are often in a hard-to-see spot. It helps to use white paint on the pointer and on the degree mark used to set your timing to spec.

back, insert a screwdriver having an insulated handle into the boot so it makes contact with the terminal, and hold the screwdriver $\frac{1}{4}$ inch from ground.

Have someone crank the engine. A strong blue spark should jump the gap. If the spark is yellow and weak, service the distributor and retest. If the spark is still weak, the coil has probably lost its punch and should be replaced.

3 Unclip or unlatch the distributor cap. Wipe it clean and look for cracks, chips, carbon tracks and broken or eroded terminals. Replace a damaged cap. If terminals are simply blackened, clean them with a piece of fine sandpaper.

Remove one secondary cable at a time and check towers for cracks and breaks. If towers are okay, clean them out with the distributor-tower brush.

Be sure cables are returned to their proper towers to prevent the firing sequences from being thrown out of whack, which could cause serious engine damage.

4 Pull or unscrew the rotor from the distributor shaft, and replace it if it's damaged. If there's a radio frequency shield over the

distributor, which prevents ignition-induced radio noise, unscrew it and lay it aside.

Now turn the distributor shaft in the direction of rotation and release it. If it doesn't snap back, the distributor should be removed and new springs and counterweights installed.

A distributor's direction of rotation can be determined by having someone in the car crank the engine as you watch the shaft. The way it rotates is the direction of rotation.

5 Sometimes it's difficult to adequately inspect points located in the distributor. To remove the breaker-point assembly, unscrew the clips holding the distributor primary wire and condenser pigtail wire. Make sure these wires aren't dam-

aged. Unscrew the point assembly and lift it from the distributor.

If the points have a grayish tint or are slightly rough, pass the distributor-point file between them once or twice at most. Moisten a cloth with mineral spirits or alcohol and wipe points clean. Reinstall them.

If points are badly worn or burned, install a new set.

Set point gap to specification, which can be determined by consulting the service decal in the engine compartment, your owner's manual or a service manual. Place the rubbing block of the movable breaker point on a lobe of the cam by having someone crank the engine in brief spurts.

Some distributor points are set by turning an adjusting screw with an Allen wrench. Others are gapped by loosening the mounting screw and twisting the slot near the screw.

Hold the feeler gauge straight, and make sure it's clean. Dirt transferred to points will cause fast failure.

Gap is set correctly when the feeler gauge offers slight resistance as you move it between points.

6 If the distributor has a wick lubricating pad resting on the cam, replace it with a new one. If

Tools pay for themselves in a few tune-ups

not, apply one drop of cam lubricant equal to the size of a match head to one cam lobe. Overlubrication causes points to burn. Reassemble the distributor.

7 Now set dwell to specification. Dwell refers to the amount of time that points are closed. Setting points with a feeler gauge brings dwell inside the ball park—setting points with a dwellmeter brings dwell home more precisely.

The dwellmeter measures dwell angle, which is the distance in degrees that the distributor cam rotates while points are closed. If points remain closed too long, arcing could occur—that reduces point life. If points stay open too long, missing at high speed could occur.

A dwellmeter is usually combined with a tachometer in a single instrument since dwell angle is usually measured at the engine slow-idling speed, and it's easier to check idle and dwell by switching from one mode to another than by hooking up two instruments.

Connect the dwell/tach's black lead to a clean ground, and the red lead to the distributor primary terminal on the coil. Set the meter to give engine rpm and start the engine. Let it warm up.

If the specified rpm reading is not recorded on the meter, set idle speed by adjusting the idle-speed screw or idle-speed solenoid on the carburetor.

Switch the instrument to "dwell." If the recorded dwell angle reading is not to specification, fine-tune the point gap.

If the distributor has an access door on the side of the housing, keep the engine idling, open the door and adjust the gap by inserting an Allen wrench into the adjusting screw. Turning the screw counterclockwise increases dwell angle. Be sure to close that access door after making the adjustment. Dirt and moisture can enter the distributor and cause damage.

If there is no access door, turn off the engine, remove the distributor cap and rotor, and reset the point gap as described earlier. If the dwell angle recorded on the dwellmeter is too great, set points farther apart—if too small, set points closer together.

Reassemble the distributor and check dwell angle again. You may have to readjust points several times

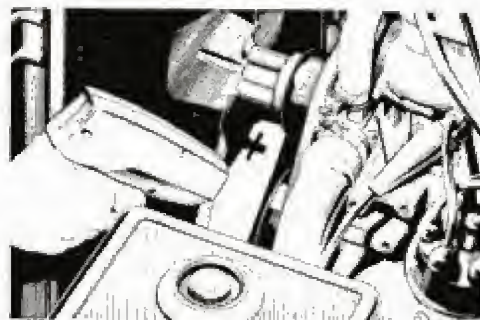
before hitting the correct setting.

8 Adjust ignition timing to specification, which refers to the position of a timing mark engraved on the crankshaft pulley, engine block or flywheel, to an index pointer. Timing the ignition is one of the most important services to perform, because faulty timing creates more pollution, leads to poor performance and may cause damage.

Connect the timing light. If necessary, the heavily insulated lead is attached to the No. 1 sparkplug by means of an adapter. The adapter is placed between the sparkplug cable and sparkplug terminal. The other two leads of the timing light are attached to the battery terminals—black lead to negative and red to positive.

Locate the correct timing mark. Timing marks of American-made cars are usually at the front of the engine on the crankshaft pulley or block. Timing marks of some imported cars—Opel and BMW, for example—are on the flywheel at the rear of the engine and can be observed through a peephole on the flywheel housing. You can make the

Timing light is connected to the No. 1 sparkplug and car battery (unless it gets power from garage line voltage). When you shine it on the timing mark, always sight down in a straight line.



Vacuum advance is removed by unscrewing it from the breaker plate in the distributor. Arrow points to lubricating wick.

timing mark and pointer stand out by coating them with white paint or chalk.

Pull the vacuum advance mechanism hose off and plug its end with a pencil. Start the engine and keep the transmission in PARK or NEUTRAL. The engine has to idle at the specified slow-idle setting.

Aim the timing light straight down at the timing marks and pointer. See if the pointer aligns itself with the specified timing mark each time the light flashes, making both appear stationary. If the pointer aligns itself with other than the specified timing mark, timing has to be adjusted.

Turn off the engine and loosen the distributor hold-down bolt with the distributor wrench. Start the engine again, and aim the timing light at the timing marks. Grasp the vacuum advance mechanism and slowly rotate the distributor to get the proper timing.

Turning the distributor counterclockwise advances timing; rotating the distributor clockwise retards timing. Remember that if the index pointer moves farther away from the correct timing mark as you rotate the distributor, turn it the other way.

When you've got timing right on, turn off the engine and tighten the distributor. Recheck the timing and repeat the procedure if necessary.

9 Now check the functioning of the distributor's centrifugal and vacuum-advance mechanisms. Aim the timing light at the timing mark and advance the throttle until the engine is running at 1500 rpm (hook up your tach). The timing mark should advance as engine speed increases and drop back to its original setting when you allow engine speed to fall back to idle. If not, the distributor should be overhauled.

Reconnect the vacuum-advance hose. Again, aim the timing light at the timing mark and increase engine speed to 1500 rpm. The timing should advance itself farther than it did when you checked the centrifugal advance. If it doesn't, replace the vacuum advance.

10 The last thing you can do for your car's ignition system is to find and replace faulty secondary cables. See *How to Test and Replace Ignition Cables*, page 134, July '74. ★★

Exotic materials make easy-going, superlight bike frames



This Teledyne bike has a titanium frame that weighs only 3.6 pounds. Maker is Teledyne Linair Engineering, 651 West Knox St., Gardena, Calif. 90248.



The stainless-steel frame of this Crescent bike will never rust or corrode. Monark-Crescent is in Varberg, Sweden.



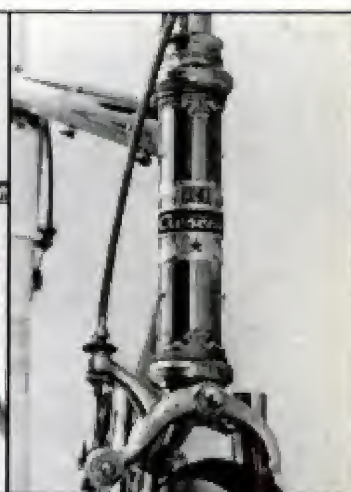
Flyweight frames are strong, make pedaling extra easy and give racing cyclists a boost—but cost a mint.

by Eugene A. Sloane

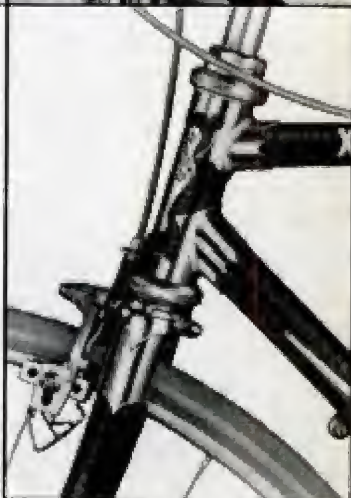
How would you like an 11-pound track bike you can lift with one finger . . . an 18-pound road racing machine that lets you take off like a banshee . . . or a 20-pound flyweight touring bike that flattens hills and cuts fatigue on long-distance trips? Thanks to space-age materials and new ways to join them, such ultralightweight bikes are now available, but at a price. You can buy a stainless-steel bike for around \$650, a titanium-frame bike for around \$900 and a graphite-fiber-frame bike for \$1300.

If you're a real bicycle nut (like me) who wants the ultimate in a light touring bike, then the high price is worth it. And the envious head-turning of real bike freaks is worth almost any price. If you're a racing

(Please turn to page 152)



Note steep frame angles and sloping fork crown of Teledyne bike (above). Stainless steel frame of the Crescent bike (above right) is hand silver brazed into handsome scrolled steel lugs. Mossberg's fiber frame tubes (right) are glued into specially designed steel lugs.



Track-racing version of the graphite-fiber bike weighs only 11 pounds. Maker is O.F. Mossberg & Sons, Inc., 7 Grasso Ave. North Haven, Conn. 06473.

How to keep your drinking water safe

Reports of contaminated water supplies have been alarming. Here's how to tell if you have a problem—and what to do if you have.

by Mort Schultz

Several months ago, New Orleans got the scare of its life: It learned its drinking water might be causing cancer. The traditionally fun-loving, high-living resort city on the banks of the Mississippi was shocked, but bravely tried to laugh it off. There were jokes about bourbon-and-water drinkers switching to soda, while anxious mothers bought bottled water for their babies.

Still, it was—and is—no laughing matter. In two completely independent studies, one by the Federal Environmental Protection Agency and another by the privately financed Environmental Defense Fund, the findings were frighteningly similar—they showed a "significant" correlation between incidence of cancer in New Orleans and pollutants found in its drinking water. The EPA in its study identified 66 organic contaminants in the water supply, 38 of which are known to be toxic and some of which have caused cancer in laboratory tests on animals. Moreover, the New Orleans area represents only one of nine Louisiana counties known to be among the highest in the nation in cancer deaths—and all draw their drinking water from the Mississippi River.

While both agencies were cautious

in announcing the results of their investigations, the implication was ominously clear: The dread possibility that drinking water can kill did, indeed, exist.

New Orleans is not alone in its problem. Other reports of contaminated water supplies—some causing severe illness—have been coming in from all over the country at an alarming rate. Consider these recent events:

■ In Ohio, several communities were found to have a cancer rate 20 to 50 percent higher than other communities. All these towns draw their drinking water from the Ohio River into which a nearby nuclear power plant discharges effluents.

■ In Miami, 176 field workers were stricken with typhoid fever after drinking water contaminated with sewage.

■ In Duluth, Minn., high concentrations of asbestos were found in drinking water drawn from Lake Superior. The dangerous pollutant was discovered to come from industrial wastes dumped into the lake.

■ In Perham, Minn., 13 people became critically ill from water contaminated with arsenic. The poison came from a well in a new housing development built on what had for-

works by reverse osmosis, will remove inorganic pollutants and some organic ones. For deadly bacteriological contamination, however, additional equipment is required.

merly been farmland. Almost unbelievably, the source was traced to a farmer who had discarded a pesticide in a nearby trench back in 1933—more than 40 years ago.

■ In Bound Brook, N.J., a woman was hospitalized in serious condition after drinking water containing gasoline. The fuel had seeped into her well from a ruptured tank at a nearby service station.

■ In Evansville, Ind., 40 organic pollutants, two of them highly toxic, were found in the water supply, and in Ames, Iowa, 15 industrial chemicals were discovered in that city's water system.

■ Out of 2600 samples of drinking water tested by the EPA across the nation, 996—more than one-third—were found to contain unsafe amounts of chemical and/or bacteriological contaminants. Known or suspected cancer-causing agents detected in such water samples include asbestos, arsenic, benzene, cadmium, carbon tetrachloride, cyanide, lead and mercury. These and other substances are also suspected of causing heart disease, liver and kidney disorders and birth defects.

What all this adds up to is simply that millions of Americans are now drinking water that can no lon-



Trim and handy, home purifiers like compact kitchen unit above can do much to help safeguard your drinking water from contamination. This model, by Culligan,

ger be assumed safe. According to an EPA spokesman, "If we don't act soon to halt the contamination of our waterways, a major crisis, which could be the most serious in our history, can strike within five years."

Increased dumping of industrial wastes into lakes and rivers, the rapid rush to the country to convert previously contaminated farmland into residential developments, and ineffective water-control measures are all helping to worsen the water crisis. The incident in Perham, Minn., in which a farmer's long-discarded poisonous pesticide turned

But this doesn't mean you should rush right out and buy such equipment—it may be costly, it may be the wrong type for the job, or it may not be needed at all. The first thing is to determine whether you have a problem, then select the correct type of equipment to combat that particular problem.

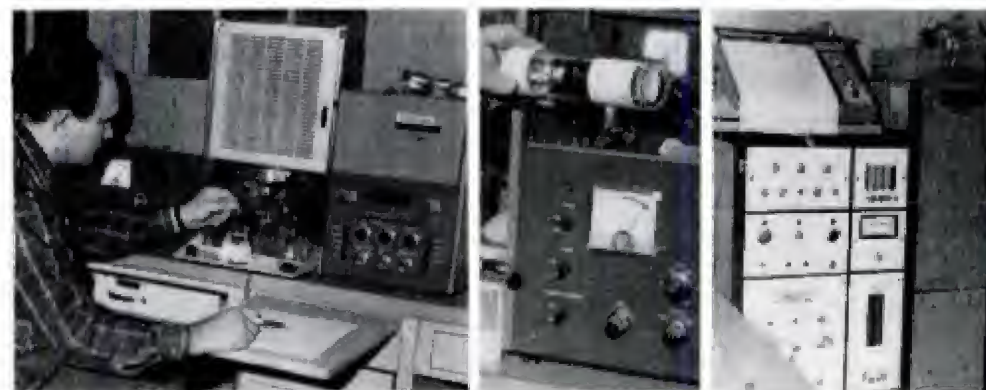
To begin with, it's important to recognize that there are three general classifications of toxic agents that can contaminate water: inorganic substances, organic substances and microorganisms (harmful bacteria known as pathogens).

purities, the EPA has proposed a set of drinking-water standards that cover a variety of both organic and inorganic pollutants. The list of maximum allowable limits is shown on page 110. While it does not include all possible contaminants, it can help you determine the quality of your drinking water should you decide to have it analyzed.

Unlike organic and inorganic substances, there's no such thing as a "safe" limit for dangerous pathogens. These are the most likely to cause serious illness, even death, quickly. Bacteriological contamination can result in typhoid, infectious hepatitis, dysentery and cholera.

While pathogens can strike any water system, their greatest threat is to the 50 million or so Americans who draw their water from private sources rather than public supplies. Such sources are not regularly monitored by public health officials and are rarely protected by water-purification equipment. Pathogen-laden sewage can get into well water from too close or damaged septic systems. Where water is drawn from a surface source, such as a pond or stream, contamination can come from animal droppings.

How do you determine if your drinking water is safe? This calls for some careful thought. You could have a so-called "carte blanche" or complete analysis performed by a private laboratory, but the cost is prohibitive, ranging from \$500 to \$1000 or more. The reason for the high cost is that each substance must be tested for individually and often



Complexity of apparatus required for proper water analysis indicates why such tests are costly, also why you should be wary of outfits that claim to use portable field testers—such equipment is not portable. At left, a Rutgers lab technician

checks water sample using atomic absorption spectrophotometer (AAS). Cathode tube (center) reveals presence of trace metal. At right is gas/liquid chromatograph (GLC) to detect organic contaminants.

up in a newly dug well proves dramatically that chemical pollutants don't lose potency with age and can come back to haunt a water supply many years later.

The lack of competent water-control technicians and inadequate governmental authority are also contributing to the problem. In one study, the EPA found that 77 percent of the people who operate water-purification systems are not properly trained in the fundamentals of water microbiology. Under present law, the federal government has jurisdiction over only interstate transportation of water. When typhoid struck in Miami, the government immediately stopped planes, trains and buses from carrying Florida water to other states. But it had no control over handling of the outbreak locally.

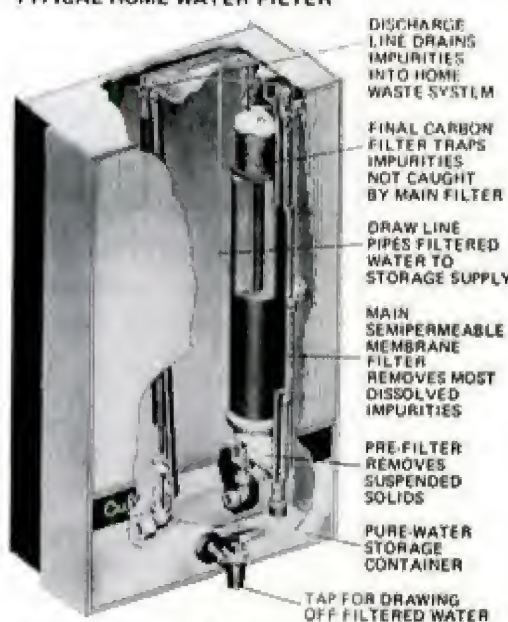
Thus, until stronger laws are passed, it's more than ever up to the individual to check his own drinking water and, if necessary, take steps to assure a safe supply. Fortunately, this is easier to do than you may think. Unsafe amounts of every known toxic substance found in water—excepting radioactive fission material—can be eliminated by suitable home water-purification equipment.

Toxic inorganic substances that get into water include arsenic, asbestos, barium, cadmium, cyanide, lead, mercury and selenium. But trace metals, as these are called, permeate our water supply by natural means because they're contained in the soil. There's always bound to be a certain amount in the water you drink. Thus their presence is not as important as their amount. When the quantity of natural trace metals in water is increased by additional amounts from industrial runoff, the combination can reach hazardous toxic levels.

Toxic organic substances, on the other hand, are not a natural phenomenon. Such contaminants, which include pesticides, gasoline and phosphates in detergents, get into water supplies through indiscriminate use or by accident. Termite eradication agents injected into the ground around a foundation are a good example. The EPA has found such agents have accidentally contaminated water drawn from nearby wells.

As with inorganics, small amounts of toxic organic substances in water may not be harmful—the question is how much is too much. To establish safe limits of normal water im-

TYPICAL HOME WATER FILTER



Reverse-osmosis purifier (same Culligan unit as shown on facing page) contains three filters—a prefilter to remove solids, semipermeable membrane to remove dissolved impurities and final carbon filter. Purified water is tapped off at bottom.

Checking for the right pollutants is the name of the game



Pathogenic pollutants can't be filtered, must be killed by disinfecting chemicals or germicidal ultraviolet light. Above is a typical home chemical-treatment system.

by different equipment, so the procedures are long and complicated when scores of possible pollutants may be involved.

Wise planning can reduce the expense, since there's no point in having water samples tested for substances not likely to be present. Test only for those you have reason to believe may exist. First, there's no need to employ a private laboratory to make a pathogenic analysis. All states and many local health departments have facilities for performing bacteriological studies and will usually do so either free or for a nominal fee. If you draw water from a private well or other local source, by all means have such a study made.

And remember that water that gets a clean bill of health one year may not necessarily be pure the next. Animal contamination or a suddenly malfunctioning septic system could cause pollution in the meantime, so it's wise to have bacteriological tests made periodically. They will cost little or nothing.

When it comes to checking on organic and inorganic substances, that's another story. Most public health departments are not equipped to handle such sophisticated analyses. Here's where you have to decide whether to go to a private laboratory and, if so, what to have them test for. If you draw water from a private supply and live within 30 miles of an industrial area, contamination by inorganic substances is possible. To find out the substances

Safe limits of inorganic and organic contaminants

Chemical	Limit (Milligrams per Liter)
Arsenic	0.1
Barium	1
Cadmium	0.010
Chromium	0.05
Cyanide	0.2
Fluoride	1.2 to 1.5*
Lead	0.05
Mercury	0.002
Nitrate	10 (1 for infants)
Pesticides:	
Aldrin	0.001
Chlordane	0.003
DDT	0.05
Dieldrin	0.001
Endrin	0.0005
Heptachlor epoxide	0.0001
Lindane	0.005
Methoxychlor	0.1
Toxaphene	0.005
Selenium	0.01
Silver	0.05

*NOTE: Amounts vary according to temperature and decrease as temperature increases. 1.2 is maximum permissible where average annual temperature is 80° F. or higher; 1.3 where temperature ranges from 66° F. to 79° F.; 1.5 where temperature is 65° F. or below.

most likely to be present, check with your state and local health authorities for a report on what trace metals are being used by plants in your area. Another source of information is your state department of industry and business.

If your home is located on or near land that was or is farmed, you may want to have your water analyzed for pesticide contamination. Another possibility is that organic phosphates from detergents used in your home may be polluting your well. However, there's no need to worry about phosphates if your septic system's drain fields and your well are far enough

Wise planning can reduce the expense. Test only for contaminants you have reason to believe exist.

apart. A safe distance is 100 feet or more.

If you're served by a public water supply, deciding whether to have private tests made—and what for—is a trickier matter. Theoretically, public water departments are carefully regulated, make their own water analyses periodically, and employ water-purification techniques when necessary. However, as evidence indicates, not all water-control systems are perfect and mistakes do occur.

One way to check the condition of

your drinking water is to contact the U.S. Environmental Protection Agency, 401 M St. S.W., Washington, D.C. 20460; the U.S. Geological Survey, C St. between 18th and 19th Sts. N.W., Washington, D.C. 20240; and your own state department of environmental protection (usually in your capital city). Request from each an analysis report on the water being supplied by your particular water company. If the reports are consistent, if they seem complete, including all three forms of pollution analysis—organic, inorganic and pathogenic—and if the levels of contaminants reported fall within the allowable limits set forth in the EPA table shown here, you can at least be reasonably sure your drinking water is being made as safe as possible.

But if the reports are incomplete, inconsistent or not forthcoming, you may well have reason to want to do some checking on your own by employing a private laboratory to make tests. To keep costs down, limit the tests to those pollutants most likely to be found in your particular water supply. As with a private water supply, try to find out from local authorities what trace metals are being used in your area. Also, in choosing a laboratory try to find one that has had experience testing water samples in your locality. It should know what pollutants are the most prevalent and may be able to help guide you in determining which ones to test for. You can get the names and addresses of private laboratories from the laboratory services division of your state department of health. Selecting the right laboratory is very important. Here are some additional pointers:

1. The service offered by the laboratory should be primarily water-oriented to assure you the best personnel, equipment and experience in water testing.

2. The laboratory should be equipped with an atomic absorption spectrophotometer (AAS) and a gas/liquid chromatograph (GLC). The AAS detects which trace metals are present and measures quantity. The GLC extracts organic substances and determines volume.

3. Don't patronize a laboratory that wants to visit your home and make "inexpensive" analyses using portable field kits. You'll waste your money. An AAS and GLC are essential for proper contamination detection—and they are *not* portable.

4. Remember not to hire a private

(Please turn to page 146)

How to get your power mower ready for the season

If you simply pushed your power mower into a corner of the garage last fall after its last mowing session, it's time to be thinking about a spring-cleaning job to ready the machine for the season ahead. Overheating, hard starting, internal engine wear and other serious problems will result if dirt trapped under, on and inside your power mower isn't cleaned away. It takes some effort to have a mower that's ready for use any time: The information on these pages will make

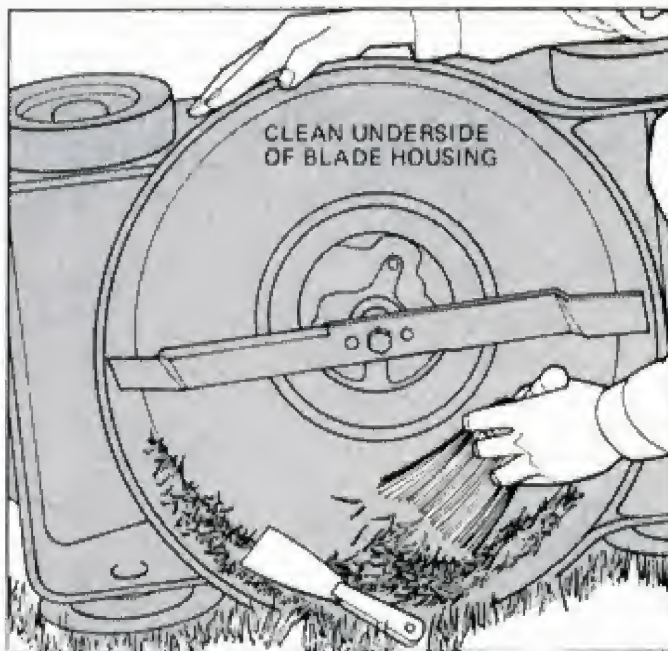
that task less troublesome because it covers the nitty-gritty of spring tune-ups.

Start inspection with the blade. A common problem is vibration caused by unbalanced blades. To check balance, remove blade and insert a screwdriver in the mounting hole. Hold the screwdriver vertically; if blade is unbalanced, blade will tip. Using a fine-grit grinding wheel, remove a little metal from the heavy end. If grinding doesn't balance the blade, replace it.

Clean cooling fins

The engine of a power mower is cooled by circulating air through fins inside the blower housing. If these fins become clogged and the airflow is blocked, the cooling process will be impeded or stopped completely. Overheating and damage to the internal parts can and will result. To clean the cooling fins, remove the blower housing and use a clean, dry paintbrush to brush dirt from between the fins. Packed-in dirt can be first loosened with an old screwdriver.

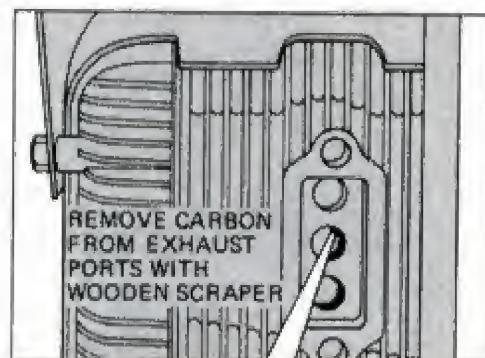
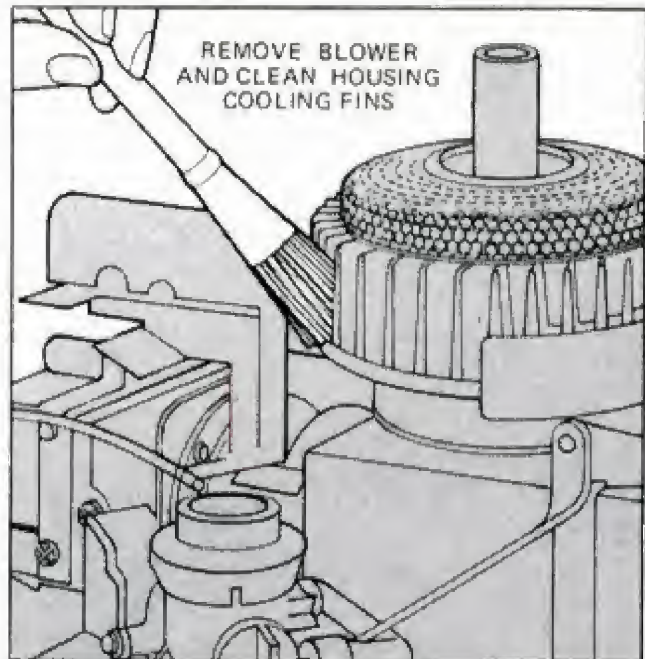
If dirt is stubborn, use a commercial degreaser and a narrow, stiff-bladed scraper to clean out the fins. Fins should be cleaned periodically during the season.



Then clean underside of blade housing

Often, because grass is moist when cut, the underside of the blade housing becomes clogged with layers of dried-on grass. If you failed to turn the mower over and clean the blade housing with a putty knife and whiskbroom after each cutting session, the task will be somewhat harder now. After each cleaning, also turn the machine right-side up and wipe the body exterior with a soft, clean cloth. A spray automotive-engine degreaser can be used to dissolve stubborn dirt and grease.

Now pay special attention to the carburetor linkage and choke-plate pivots. To clean these units, use a spray-type automotive-carburetor cleaner that's available at auto supply outlets. Then apply a drop of oil to the moving parts. Finally, remove the wheels, thoroughly clean the hubs and axles, and then coat the axles with a light layer of an all-purpose grease.



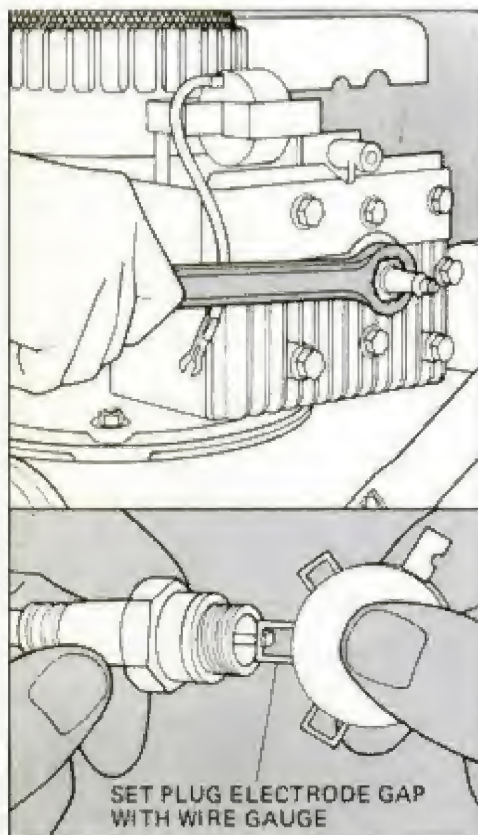
Exhaust ports

Carbon is also a form of dirt, and an accumulation of it in the exhaust ports of power-mower engines (two-cycle engines, in particular) will reduce the power output appreciably. Before scraping off the carbon, exercise the precaution of first removing the sparkplug from the engine (to prevent the engine from starting). Then remove the muffler.

Next, turn the crankshaft slowly by means of the starter cord or self-starter until the lower part of the piston covers the ports. In this way, carbon will be kept out of the cylinder when it's scraped loose.

While you're at it you should scrape the carbon from the muffler and inspect the muffler gasket. If you discover that either part has been damaged, replace it promptly.

Correct oil-gas mix necessary for proper operation of two-cycle engines

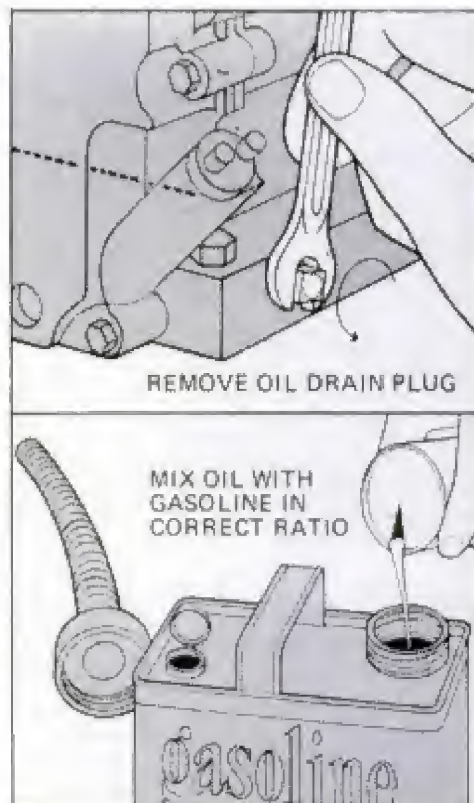


Fuel-oil mixture

If your power-mower engine is four-cycle, warm it up, then shut it off. Remove the oil drain plug and drain the dirty oil into a waste pan. Replace drain plug and fill the crankcase through the oil filler to the level mark. Use the type and weight of oil specified in your owner's manual.

In two-cycle engines, a mixture of oil and gasoline is used in the fuel tank. Improper fuel-oil mixture is the main cause of operational problems with two-cycle engines, so check the owner's manual for the correct ratio. (The correct mixture is usually $\frac{1}{2}$ pint oil to 1 gallon gasoline.) The oil should be of the type and weight specified in the owner's manual or of the type made especially for two-cycle engines (available at hardware and auto parts stores as well as at gasoline stations).

Insufficient oil in the mixture means that engine parts will be improperly lubricated, resulting in overheating and seizure. Too much oil causes engine smoking, loss of power and sparkplug clogging.



Sparkplug checkout

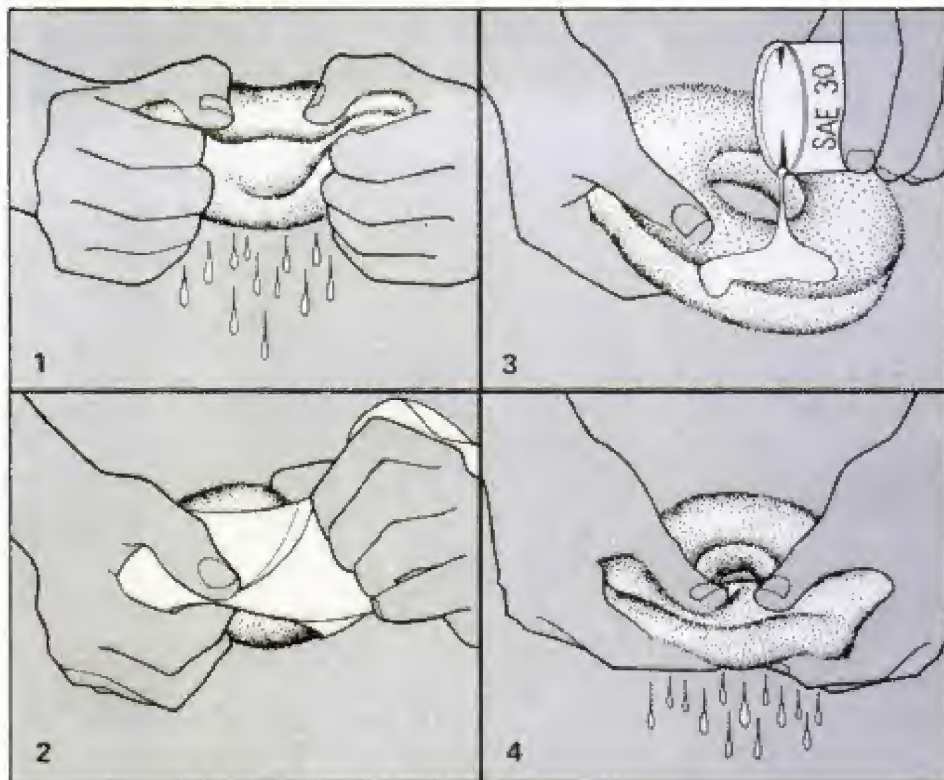
Remove the sparkplug and examine it carefully. If the electrodes are burned away or pitted, or if the porcelain is cracked, discard the plug and get a new one of the same designation. You will find the designation printed on the plug. Generally, 100 operating hours should be considered as maximum life for a plug.

If the plug looks fine, use a penknife or small wire brush to scrape dirt from around the electrodes. If you have a compressor, complete the cleaning with a blast of air. Lacking this equipment, blow out particles by mouth.

Whether the plug is new or not, set the electrode gap to the manufacturer's specification with a wire-type, sparkplug gauge like the one shown above. If you've lost the owner's manual and don't know the gap specification, for two-cycle engines gap is set at .028 to .033 in.; for four-cycle, it's .025 to .028. Insert plug and finger-tighten. Then, give it an additional half turn or so with a wrench.

Inspect the sparkplug lead wire. If it is not too badly frayed or damaged, you might be able to patch it with insulating tape. Otherwise, you will have to get at the coil to replace it; in some machines, this means removal of the flywheel—a job best left to a professional. Sometimes, the lead wire is connector-fastened to coil so that it can be replaced with coil left in place.

In other mowers, the wire is molded to the coil. To make the change, both wire and coil must be replaced.



Polyurethane-sponge air cleaner

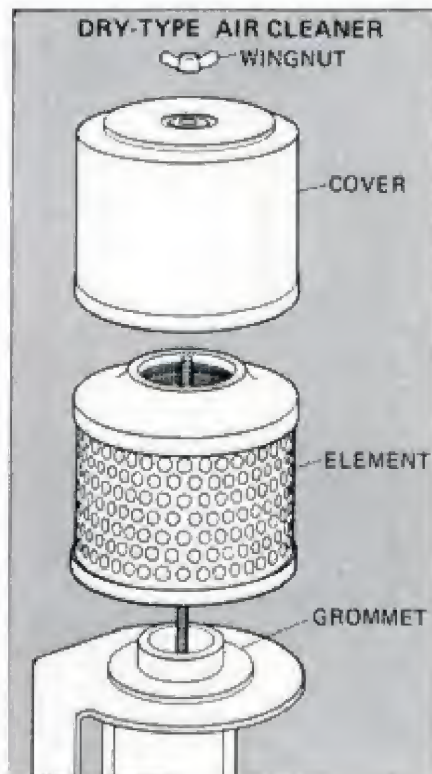
An air cleaner is the primary protection a power mower engine has from dust particles that can get inside to clog moving parts. One common type of air cleaner has a polyurethane-sponge element as shown above. To clean it, (1) wash element in liquid detergent and warm water, (2) wrap in a cloth and squeeze dry, (3) saturate with SAE 30 engine oil and (4) squeeze to remove excess oil. Clean container that holds element, replace element and cover tightly.



Oil-bath air cleaner

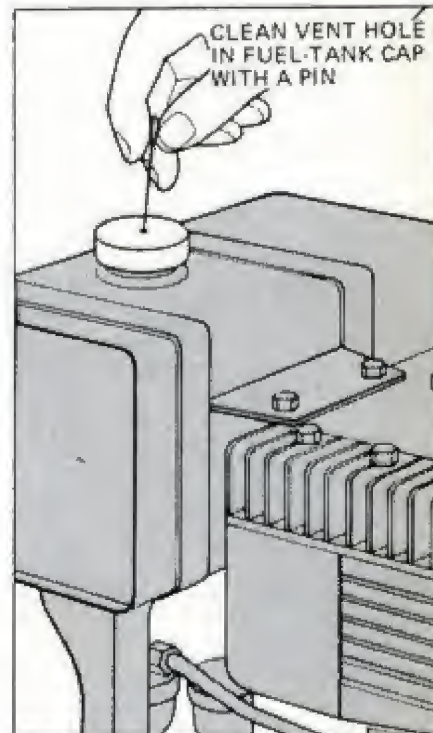
This type of air cleaner comes with a container that uses a layer of oil to trap dirt and dust particles.

To clean it, remove air cleaner from the engine and disassemble. Dump out the dirty oil and wash all the parts thoroughly in a solvent such as kerosene. Let these parts air-dry; then reassemble them and fill the cleaner to the level mark with a clean SAE engine oil.



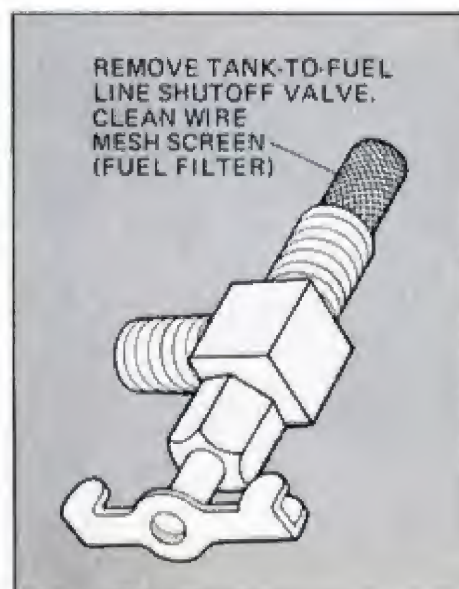
Dry-type air cleaner

With this type of air cleaner, unscrew the cover as shown above, take out and examine the filter element. If the element is paper, replace it. If it is metallic, carefully tap it on a flat surface to loosen dust and dirt. Then wash it thoroughly. Finally flush the element (from the inside out) with water until the water that comes out of the sides of the element looks clean. Allow the element to air-dry before replacing it on the mower.



Fuel-tank cap

Some fuel-tank caps have a small vent hole. If it becomes plugged, a vacuum is created that will stop the flow of fuel and the engine will stall. Remove cap and clean out dirt in hole with a pin. *Take care not to enlarge hole.* In addition, be sure that only proper fuel is poured into fuel tank (pure gasoline or correct mixture of oil and gasoline). Use a clearly marked can for gasoline; many tanks and carburetors have been fouled up by kerosene, paint thinner or other liquid poured in by mistake.



SEDIMENT BOWL-TYPE FUEL FILTER



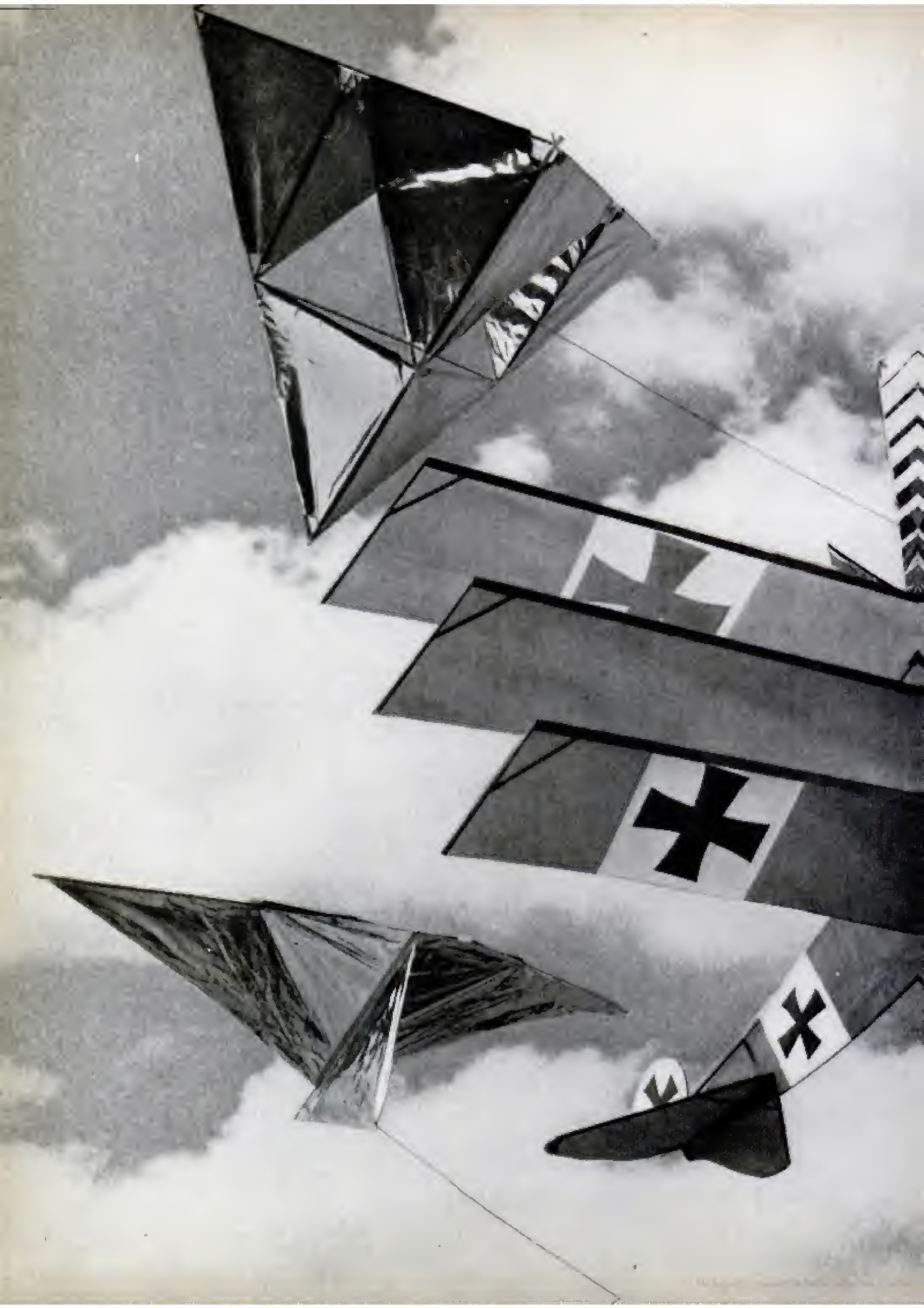
Fuel filter


Remove the fuel filter from your power mower and wash it thoroughly in kerosene, or let it soak in engine degreaser. The filter in many small engines is located in the tank-to-fuel line shutoff valve. Remove the valve to get at the filter (far left).

Other engines have a sediment-bowl-type fuel filter that houses a ceramic element. Remove the bowl. If there is gasoline in the tank, be sure to first turn off the shutoff valve. Disassemble the filter and wash the parts in kerosene. If you're using engine degreaser, soak all parts for an hour or two; then wash in water and dry with an air-pressure hose which also blows away dirt.

All that remains for you to do is to tighten all body bolts and fasteners on your mower. Your clean machine is now ready for use.

★ ★ ★





Go build a kite

Make one of these fancy flyers—
from a kit or from scratch—to take
advantage of March winds.

by Stephen Walton
ASSISTANT EDITOR, HOME AND SHOP

Some great kites come in kit form these days. The pyramid-shaped Tetra and the versatile Skylinks, shown in its catamaran-like, stunt-kite configuration, are easy to assemble from their plastic components. The Red Baron at center, patterned after a World War I Fokker triplane, is a different story—all its parts except plastic wing roots must be cut to shape from stock supplied, and a neat job may take you all of the 14 hours it took me. At lower left is a scratch-built delta kite in metallized Mylar—but you could make

(Please turn to page 136)



CAMPING GOES COMPACT . . . MORE CONVENIENCE, LESS COST

Fresh air is still free, and new gear to help you enjoy it is being made smaller, better.

by Bill McKeown
OUTDOORS EDITOR

More for your money—in fun, relaxation, change of scene, adventure—is waiting outdoors for this year's camper. Gear is getting lighter, better, simpler to set up and use. Fit out now for a bargain vacation and you can make "roughing it" an option instead of an essential. And a

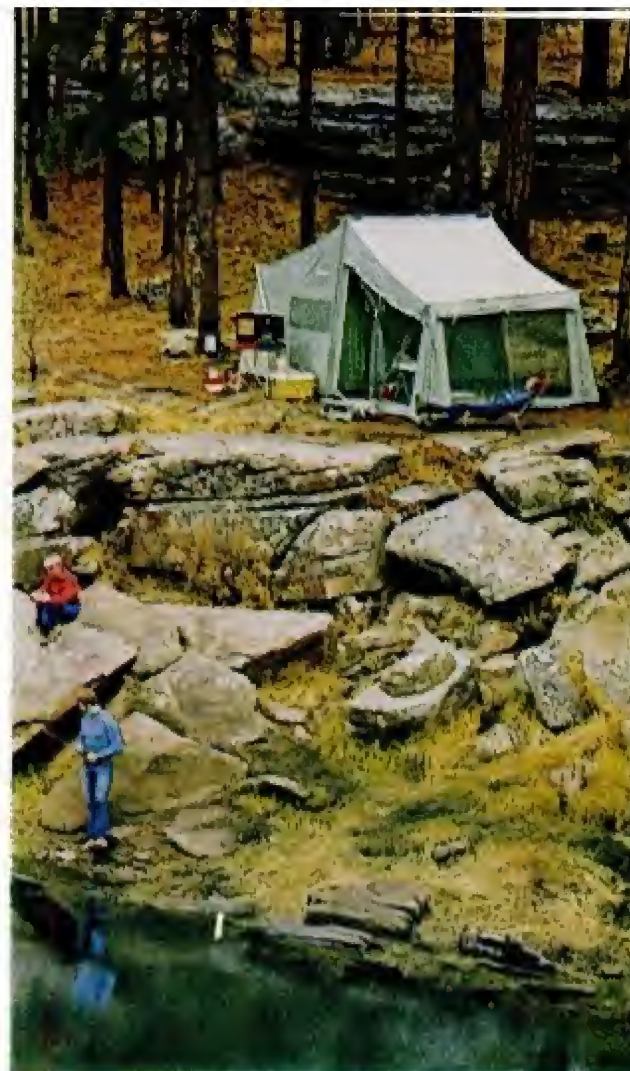
lot of campers are turning turtle—and picking new equipment that's easy to pack on a back, a bike, a small boat or car.

While price tags on quality sleeping bags, knapsacks, tents and trailers have not come down, many outdoorsmen outfit for less cost with less elaborate, more compact equipment—or rent the necessary gear at additional savings.

As always, hoofing it is the cheapest way to go, and all that's necessary are comfortable clothes, shoes and rucksack. Lashing sleeping gear to a backpack or bike stretches your

radius of action. But many campers this year won't be planning a cross-country trip, and instead will stay closer to home. That can mean a choice of simple shelter gear with little fear of week-long rains for the Southwest camper, or high-altitude cold for a hiker in the East. Today's shopper will save by buying a sleeping bag or tent that's suitable for nearby conditions rather than the budget-breaking ultimate gear to handle everything from the tropics to the arctic.

Light daypacks, frameless or with the stiffening inside, are becoming



Easy-going gear will include the low-profile camp trailers, backpacks in many sizes, tents smaller or bigger, cars and vans that can be converted for bargain camping.

the sensible choice for short trips where a cargo portage model is not required.

A better quality of metal backpack frames is now contoured to fit the back, with shoulder and hip straps that balance and divide the load. The short foam pad has become the new mattress choice for light-gear camping.

Fill comprising synthetic insulation proves to be a worthwhile rival for the down lofting in clothing and sleeping bags.

Pack and touring tents are lighter, more durable and flame-retardant,

with wall-slot or outside suspension that keeps poles out of the middle of the interior or doorway. Floors and mosquito netting are now standard, and an additional fly cover to ward off driving rain and blazing sun is no longer an odd extra. Mountaineering tents have been redesigned to cut down the wind resistance during heavy storms.

Larger family cabin models show the best of European influence with screened-in outer areas that divide the tent into separate living room and bedroom. Camping in one spot becomes more pleasant, without the

restless need to move on every night.

Camping trailers with canvas or solid sides, and small and light enough to be towed by compacts, have showed popularity. Some small travel trailers are now designed to sleep large families. Vans and panel trucks have become favorites of younger campers, while van conversions that provide raised tops for standing headroom and added cooking and bathroom facilities, have increased in sales.

Luxury motor homes and trailers are available, but there are many cheaper ways to go as well. ★★



Sew—

Several hours of easy work can cut your costs in half.

by Bill McKeown

How would you like a 50-percent discount on camping gear that you need? Not cheap equipment, either, but the very best obtainable—finely made and probably better than any you could order anywhere.

Nor is your choice limited to a handwoven belt or watch band. Look over the list below and see if there isn't an item—or, more likely, many—that you wish you had:

- Down-filled sleeping bag
- Bag liner
- Bivouac cover
- Down jacket
- Parka
- Ski coat
- Down vest
- Down sweater
- Down pants
- Gaiters
- Poncho
- Booties
- Overboots
- Chaps
- Rain gear
- Hood
- Tent
- Stuff sack
- Backpack
- Bike bag

Many of these come in assorted sizes, types and colors, while the variety of items offered is growing all the time.

At first glance, a price tag of \$100 for a sleeping-bag kit or tent kit can seem steep, especially since you still have to put it together. But if you don't enjoy working with your hands, you probably wouldn't take up camping, and the kit manufacturers have found their customers already know about but don't want the flimsy cut-rate items available from some surplus outlets. For example, if you buy a Carikit Polar sleeping-bag kit for \$83.50—rated for -20° F.—and then add the optional \$21 worth of "expedition down fill" for even more insulation, it's obvious you want the best. Or perhaps you select Frost-



Turning parts into a pack took an evening, Virginia Hricko (top) found after following kit's complete instructions and using all the comprehensive enclosures. Fabrics, goosedown packs and thread were in the boot and bootie kits (center). Final reward of a little needlework (bottom) is a bargain in quality gear.



you can save with camp-gear kits

Kit manufacturers

CARIKITS

Holubar, Box 7, Boulder, Colo. 80302.

EMSKITS

Eastern Mountain Sports, Inc., 1041 Commonwealth Ave., Boston, Mass. 02215.

FROSTLINE

Frostline Kits, 452 Burbank, Broomfield, Colo. 80020.

MAKIT

Mountain Adventure Kits, Box 571, Whittier, Calif. 90608.

line's Cougar model at \$58. It weighs five pounds, 10 ounces, but you sew the special full length foam pad right into the down bag, where it is always ready for use.

Because you or your wife do the sewing, you can be sure that no one took shortcuts on inside seams that don't show, and you can also double stitch or lock stitch spots where you know from experience a zipper can tear or a D-ring pull loose when you're miles from nowhere. Basic sewing experience is helpful, though not essential, and these kits could be sewn by hand rather than machine if you had a lot of time. According to the EMSkit division of Eastern Mountain Sports, "Novices seem to understand the instructions more easily than experienced seamstresses, and the most satisfied customers are those who enjoy making their own equipment rather than those who try to save money." And any man who thinks that only women can sew has never been a bachelor very long, or hasn't visited a sail loft recently.

To test kit instructions and materials, and because they looked great, we first selected down booties, \$5.95, and overboots, \$4.95, available in blue, green or orange. They are new items from Frostline, largest of the camping-kit manufacturers. Both came with all the materials—thread, elastic, cord and laces—plus illustrated instructions so explicit that someone who had never sewn before could have worked them out. Frostline and others also have a customer service representative who can answer any questions by mail or telephone.

Even after years of sewing, Virginia Hricko had never edge-seared fabric, but the instructions made it easy. You carefully pass a flame along the edge of the Ripstop Nylon without touching it. The heat seals the edge so that it will never ravel apart during wear, washing or cleaning. It is easy to see why in normal factory assembly there's no time to spare for refinements such as this.

Many products in Frostline's assortment of 46 kits come in a variety of sizes, ranging down to clothing for children and pack carriers for babies. Their Add-On sleeping bag starts with a 42-inch length, and can later be extended with 12-inch sections as the youngster grows. Both Frostline and Carikit, the sew-it-yourself division of the famous Holubar line, provide in small plastic packs the down you will use to fill their insulated clothing and bags. These, we found, make a neat and easy way to handle the very fluffy feathers.

And even if you have no plans for camping or cool-weather sports, the kit makers' catalogs deserve study for their versatile bargain travel packs and bags. We test-constructed kits from each, and found them uniformly well designed. They were complete with all necessary parts, and with instructions that told both the how and, reassuringly, the why of each succeeding step.

Cross-country and downhill skiers, hunters, bicyclists and travelers using almost any other means of getting around are likely to find kits designed especially for them. Quick orders can be placed by telephone and credit card.

Though it would be hard to select our favorite kit to sew up and use, our best bag-title award would certainly go to Eastern Mountain Sports for their \$16 model in navy or orange. It's the EMSkit Knapsack-snackpack Rucksack. It proved to be easier to sew than to say. ★★



Sew-it-yourself Aspen jacket comes in kit from Frostline for \$26. A few hours' work converts pieces in package into quality down-filled coat that could cost \$49 or more ready-made.



Though somewhat narrow with no shoulders, highway was easy to drive, neverthe-

less, by author and his wife in 20-foot Winnebago Minnie Winnie van conversion.

New road to Old Mexico

No longer a challenge for only off-road four-wheel-drives, the Baja is becoming a magnet for self-contained RV families.

by Bruno Michetti



New RVs for the road

Larger assortments of accommodations are found in rigs that roll for fun in '75.

by Bill McKeown

"More into less for the same," is the recreational vehicle formula for 1975.

That translates into bigger and

better accommodations in smaller travel rigs at prices not much higher than last year. And with a buyer's market in the works, the careful RV



Low in profile and wind resistance, high in headroom, new 6-sleeper SK-101S with lift roof and fold-out sides (folded in top view) joins wide AMF Skamper fold-up line.



Barren landscapes are part of the appeal for Baja campers. Cactus and palms edged this plateau swimming hole lagoon.



Fishing, snorkeling, clamming, swimming, total relaxing in lukewarm waters of Laguna Santispac were daily activities.

Adventure in your recreational vehicle is waiting just south of San Diego, Calif., at the Mexican border. There the new Baja Transpeninsular Highway starts at Tijuana and runs south for 1050 newly paved miles. A few years of tourist travel will change it, but right now it offers an unspoiled glimpse of the past.

Our vacation was scheduled for mid-summer and we knew we needed an airconditioned self-contained traveling home big enough for our family of four, yet small and rugged enough to turn off the 19-foot wide ribbon of

pavement. Winnebago's Minnie Winnie proved an ideal answer. Our two boys—Mark, 9, and Matt, 8—slept over the cab up in a queen-sized bed. We never needed to convert the double berth dinette, but made up the rear sofa into another queen-size bed for my wife and myself each night. The Winnie's 20-foot length and moderate rear overhang handled rutted-trail turnoffs with ease.

After skirting the Pacific, the road swings along the Sea of Cortez. We found our favorite camping spot on a curve of white sandy beach, called

Laguna Santispac, on the Bay of Concepcion between Mulege and Loreto. Swimming, fishing and clamming were exceptional, but bring your own gear and lures. (We found room for six rods in our hollow rear bumper.)

Getting gas, distilled water and American canned foods is not difficult, but take along guide books, Mexican car insurance, complete first-aid kit, snorkel gear, small-denomination travelers checks, and little bags of Mexican and American coins for change. You'll find many new sights and much enjoyment. ★ ★ ★



Need to sleep six in a 19-footer, and want one with a real bathtub? New Nineteen by Shasta II, one of 10 redesigned travel trailers, offers more standard equipment.

shopper should find bargain selections.

This year's strong trend is toward vehicles that can do double and triple duty—family car, business van or truck, travel bus and summer camp cottage. Add a preference for compact rigs with modest cost and gas consumption and you can see reasons for the swing to the RVs we show here.

A number of companies are now turning out production-line conversions of panel trucks with the jazzed-up interiors that are currently popular. Murals on the outside and deep-

pile carpeting on the inner walls as well as on the roof are the trademarks of these carefree successors to the beach buggies that used to be home-built products.

Fold-up compacts cost less, which may account for the recent growth of tent and hard-side camping trailers, plus pop-up tops for pickups and vans. Lower wind resistance plus easier towing and garaging are added advantages.

Travel trailers, van conversions, and mini motor homes all pack in more accommodations in the form of beds and baths. Full bathtubs are

(Please turn to page 128)



Designed for small-car towing, new Trail Star XL for '75 from Starcraft has 960-pound curb weight, added safety catch on lifter system, 110/12-v. converter.



Chateau Club Wagons and Econoline vans from Ford have higher gross weights, larger load and towing capability, longer front-end design, easier engine access.

Rancho poncho: a quick-change bivouac bag

by E. P. Haddon



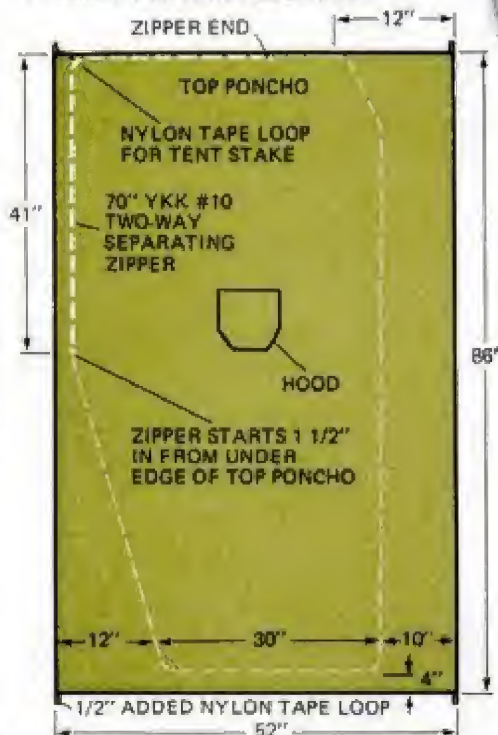
Two ponchos—one hood inside the other and zipped together along bottom and side—look like only one (at left) when worn.

Tenting between twin ponchos can be easy with pole rigged in corner and top hood guyed up and open for through ventilation or closed with drawstring to keep out wind, rain.



Sewn together as shown at left, ponchos form a bivouac bag shelter with pocket for mummy-shaped sleeping bag and room beside it for sleeper's clothes as well. Ensolite foam mattress also fits inside; pack or stuff sack becomes a pillow.

TRIMMED MINI-TENT FLOOR PONCHO



allow staking down with tent pegs or holding the front open using a line to a tree or with short poles. An outside A-frame can be made with two 22-inch sections of aluminum poles to support the closed end of the top poncho. A single 22-inch pole section supports the front corner of the tent over your head and is guyed with a short nylon line.

For more compact packing, shorter aluminum poles from Gerry or Eastern Mountain Sports will provide 12-inch fitted sections when used. Poles and screw-threaded aluminum spike tent stakes add only one-half pound to your pack.

When used as a bag or tent, the drawstring of the bottom hood can be drawn tight to make the floor moistureproof. Raise the top hood with a guy line and leave it open for added ventilation and space within the bivouac bag.

To complete my own extra-light pack, I use a North Face Superlight down sleeping bag, half-pound Ensolite 21x42-inch mattress pad, extra socks and a down vest, GI canteen cup with a plastic mug stowed inside. These go in a Cannondale Mountain Tour Pack with an aluminum handle that is compact enough to fit under an airline seat. My Heatab stove and enough fuel pellets for three days fit in a shirt pocket.

With gear this light I find that I require but four ounces of dehydrated or quick-freeze foods plus high-energy supplements per meal. Lightweight camping indeed has come a long way in the last few years. ★ ★ ★

For really lightweight wilderness backpacking, you can easily convert a couple ponchos into a triple-duty accessory that will keep you dry during a rain along the trail, make a neat bivouac bag at night for your sleeping bag, and stake out into a mini-tent with guy lines or small poles for support.

A friend in Sante Fe, N.M., designed it from two 52x86-inch Kelty urethane-coated waterproof ponchos, stitched it up on his ancient portable sewing machine, and appropriately dubbed it a "rancho-poncho."

I first tested mine on a hike of several days through the rugged Big Bend Country of west Texas that I had first covered 48 years ago. This region is sometimes buffeted by strong winds, and nighttime temperatures can drop below freezing.

I often pack without a tent, but something is needed here to break the wind. Anchored on exposed ledges of the Chisos Mountain South Rim, the rancho-poncho shed winds that would have pounded a good expedition tent.

To assemble, two ponchos are fitted together with one hood inside the other. A small portion of the lower or floor poncho is trimmed away and shaped to hold the foot of a mummy-type sleeping bag, as shown in the diagram. The two are then sewn together with a machine using 100-percent nylon thread, and the seams are waterproofed by applying a urethane-base seam sealant.

I added a two-inch-wide strip of ripstop repairing adhesive tape on the topside of seams for absolute waterproofing.

A zipper is worth adding, starting 41 inches from the top on one side and extending up and partially across the head of the tent. A 70-inch YKK Delrin No. 10 two-way separating zipper was my choice. Attach a nylon loop to both the inside and outside zipper pulls to avoid fumbling in the dark.

Two nylon tape loops are on Kelty ponchos at the front bottom corners. Sew on two more loops of 1/2-inch tape at the other two corners. These

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HM Specialties

EASY RIDERS

(Continued from page 85)

120 Wall St., New York, N.Y. 10005.

NORTON 850 INTERSTATE. The Norton 850 is to motorcycling as Bobby Riggs is to the game of tennis: Getting old and a little stiff in the knees, but still able to blitz many of the hot newcomers. Vertical twin engine format with twin Amal carburetors, twin exhausts, non-unit four-speed transmission, chain-driven all-metal plate clutch and double downtube cradle frame make Norton the most straight-forward, conventional tourer in motorcycling. The 850 Interstate continues to rate among the five or six most powerful and best handling "big bikes" currently in production.

The overhead-valve, pushrod engine delivers 56 foot-pounds of torque at 5000 rpm and 60 bhp at 6200 rpm. This translates into tremendous low and mid-range steam that continues to give Norton a "hot" reputation. Vibration below 3000 rpm is quite noticeable, but at highway cruising speeds, it stops almost completely due to Norton's unique "isolastic" construction. Large 7.2-gallon gas tank provides a 300-mile touring

range. But a rather poorly padded seat tends to make those 300 miles less comfortable than they might be.

Safety and convenience improvements include: Redesigned instrument cluster with special fingertip controls for horn, lights and blinkers, hydraulic chain adjuster, rear disc brake and electric starting. *Norton Villiers Triumph Corp., 2767 East Huntington Dr., Duarte, Calif. 91010.*

SUZUKI RE 5 ROTARY. The new Suzuki RE 5 Rotary is the first and only tourer designed with NSU-Wankel power. It was slightly more than three years ago that Suzuki obtained license to design an engine based on the patented Wankel format. By 1973, a working prototype motorcycle was undergoing testing at the Suzuki factory in Japan.

The RE 5 is just under 500 pounds (dry), its wheelbase stretches 59 inches and seat is 32 inches high. Displacement rating is 500 cc.

The motorcycle has tremendous power. Performance from a standing start is deceptively sluggish due to inertial flywheel effect from the engine's rotor. But speed accumulates quickly, smoothly and sound-

lessly with a bewildering—almost scary—momentum because there is no noticeable change in vibration and very little sound. Highway cruising is smooth and effortless, power is always on tap and the seat-footpeg-handlebar arrangement is extremely comfortable.

Handling is predictable and secure. The bike steers precisely and tracks with accuracy. Brakes, consistent with those of other Suzuki road machines, are sensitive to the touch and have strong stopping power. Twin discs on the front complement a large single drum-type on the rear.

Suzuki engineers have designed the single-rotor Wankel for easy servicing and have also succeeded in tucking it into a fairly compact cradle area. Liquid cooling is provided by a somewhat bulky radiator, mounted at the front of the chassis.

Economy was developed through much research. Air/gas mixture is lean and a special two-stage Mikuni carburetor has two throats—one fuels combustion below 1700 rpm; the other opens when a generous throttle is applied. Intense heat created by the lean mixture is controlled through the liquid cooling system assisted by an electric cool-

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ing fan that operates automatically. Built-in reliability is achieved by limiting the engine to a low, maximum redline of 6500 rpm. A special hardness coating protects the rotor housing from wear and insures long engine life.

A five-speed transmission with wide-spaced gearing makes the bike convenient in town and exciting on the open road. Styling by Italy's famous Giugiaro makes an otherwise bulky cycle look surprisingly lean and appealing. Finally, Suzuki's 12-month/12,000-mile guarantee supports its faith in what appears to be a versatile tourer with an entire style of its own. *U.S. Suzuki Motor Corp., 13767 Freeway Dr., Sante Fe Springs, Calif. 90670.*

TRIUMPH TRIDENT. First introduced in 1969, the latest version of the British-built Trident is a handler. Its single-downtube, twin-loop cradle frame has long since been proven for stability and balance on racetracks and expressways the world over. Girling shock absorbers are the pillars of good suspension in motorcycling, as are the Triumph's Lockheed disc brakes for stopping and the Dunlop K-100 tires for road holding. The 750-cc vertical OHV three-cylinder engine has smooth power. With an electric starter, left-side shift-lever, special fingertip controls and smart new styling for 1975, the new Trident—even in view of minor faults of its forebearers—has the earmarks of a winner. *Norton Triumph Villiers Corp., 2767 East Huntington Dr., Duarte, Calif. 91010.*

YAMAHA XS 650B. Simplicity is the basis for continued popularity of the "650" Yamaha. The XS 650B is a lean, clean touring machine.

The single overhead-cam, 650-cc engine has a compression ratio of 8.4:1—suitable for low-test gasoline. A healthy 40.1 foot-pounds of torque at 6000 rpm with an estimated 46 bhp at 7000 rpm highlight a high-revving engine that has strong pull from below 25 mph right on up through the 100-mph barrier. Riding comfort does not fess up to standards of such tourers as the BMW R90/S or Kawasaki Z-1. Neither is it as harsh as that of the Ducati Sport.

Brakes are excellent. Both front disc and rear drum are effective, fade-free and do not grab. The five-speed constant-mesh transmission is precise but not particularly smooth or quiet. Hand controls, switches and instrument console are thoughtfully designed for safety. *Yamaha International Corp., 6600 Orangethorpe Blvd., Buena Park, Calif. 90620. ★★*

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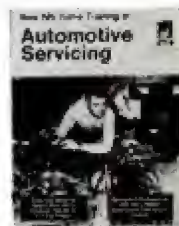
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NEW FOR THE ROAD...AND RV ACCESSORIES

(Continued from page 121)

to be found in a number of rigs less than 20 feet long.

And for campers who like a lot of room, there are the new park models. With tipout rooms, they can be set for a week's stay, or for a year. ★★



RVs with a new name from a standard in RV industry, Winnebago, are the 25 and 27 Itasca motor homes on Chevy chassis.



With new look and streamlining for familiar Winnebago, Custom 29, 27 and 25 have first major style change in seven years.



Motorizing for a line that used to be all trailers, Holiday Rambler now has mini-motor home models with beds for up to 6.



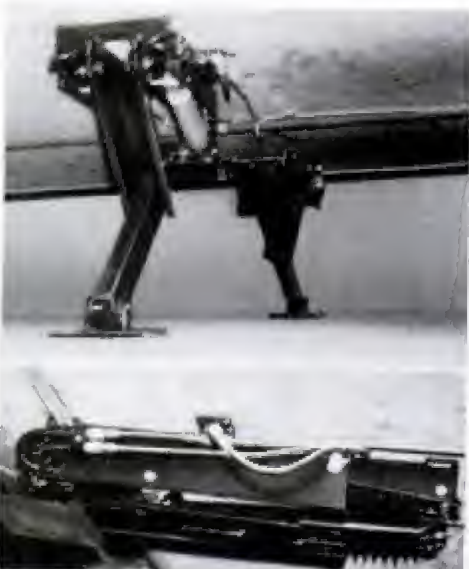
More passenger room in the cab, and more cargo capacity, are available with three Dodge D200 Club Cab camper packages.



Families up to seven can sleep in new 1975 JS-715 Serro Scotty 15-footer with overhead bunk/storage compartment.



Fabric-covered and weighing 30 pounds, Kenko's aluminum-framed Porta Kap for pickups has screens, Fastak tie-downs.



Hydraulic power lifts installed at front of trailer lower for leveling (top) or retract up in Prestolite's prototype system.



Pickup covers are more popular this year, and Super Kap from Winnebago has sliding screened windows, locking rear door.



Bolt-on under-car receivers for Class 3 frame or load-equalizing hitches come in Valley Tow-Rite kits, need no welding.



Ladder for roof racks has been designed to fit doors of Chevy, Dodge or Ford van conversions by Kenko Engineering.



Fifth-wheel trailering with passenger car is possible with Winter Welding's Ace hitch adapter, shown with Blazon Elite.



Awning in self-contained automatic roll-up box for vans, campers, travel trailers is named Shadow Box by Carefree of Colo.



Cross-leveling of recreational vehicles is aided by device with 10-inch lift travel made by Drier Leveler, Cortland, N.Y.

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GROW A VEGETABLE BONANZA

(Continued from page 75)

frame. In frame or flat, allow two inches between plants.

Seedlings should be sprayed with Maneb to prevent "damping off"—a fungus that attacks the stems. Also, give the seedlings as much light as possible and guard against extreme humidity.

A simpler propagation method is to use peat pellets, sowing several seeds in each pellet and letting the strongest sprout remain. At the proper time, plant them in the ground, pellet and all. Easiest way is to buy seedlings ready for planting.

When to plant

The sample plot designs presented with this article allow for consecutive spring, summer and fall plantings, making the small garden as productive as possible. Harvest times of each season's plants roughly coincide with the times of planting of new crops.

The timetable reflects conditions of the lower New York State area, a moderate climate typical of much of continental U.S.A. Of course, growing seasons are shorter farther north and longer in the South. The fall planting schedule presented here applies only to areas where the first frost comes no earlier than the latter part of October or the fall season continues to be relatively mild even after a frost.

Remember that all seedlings must be "hardened off"—they must have a week's exposure to gradually lower temperatures in making the transition from greenhouse warmth (or the sunny southern window where they've been kept) to outdoor temperatures.

Extra care should be taken with some crops. Cabbage, for example, should not go through a 7-to-10-day period of daytime temperatures consistently below 50° F. or heads will form prematurely.

Choosing varieties

Another result of the sophisticated hybrids developed is that there is a variety of every vegetable especially suited to nearly every specific locality. This is particularly true of tomatoes, eggplant, peppers and lettuce—in some cases a difference of 50 miles can call for two varieties. Most state agricultural colleges publish annual lists of recommended varieties by locality. These are available by mail. Your local agricultural agent will also have this information.

Diseases and pests

The best defense against diseases and pests in the small garden is pre-

vention. Maintain the plants in vigorous growth, remove all weeds from the plot and the close surroundings, and choose resistant strains of vegetables adapted to your region. To prevent cutworms from decapitating young seedlings, protect them with paper cups, the bottoms of which have been removed, when you put them in the ground.

Beyond this, weekly sprays or dustings of a pyrethrum-rotenone mixture can be very effective against a wide range of pests. Both substances are natural derivatives of plants and have a low toxicity to mammals. Caterpillars can be discouraged quite effectively with bacillus thuringiensis (sold under the trade names Dipel WP, Biotrol XK, and Thuricide HPC), which is nontoxic to mammals and other insects. This will prevent most of the damage done to members of the cabbage family.

Cabbages, brussels sprouts, cauliflower and kale also may suffer from maggots attacking their root stems. Onions and radishes may also be maggot victims. Use Malathion, a systemic spray that enters the plant's tissues. Malathion is also effective against leaf miners, a real problem in beets, turnips and leafy vegetables. These insects enter the leaf, leaving a telltale line of dead tissue to mark their paths as they eat it away. Malathion is one of the least toxic of the systemics, but that's not saying a lot. Follow directions and use with care.

Corn will almost certainly be attacked by many pests. Two of the worst, corn borer and earworm, can be prevented by applications of Sevin. This has a low toxicity to mammals, but is deadly to bees and many beneficial insects, so don't use it on anything in flower.

Most fungus diseases can be controlled by selecting resistant strains of vegetables and maintaining the garden properly. In case of "club root," a fungus that greatly enlarges parts of the roots of cabbage, raising the pH of the soil to neutral is a good preventive.

Other likely fungus victims are the leaves of cucumbers and melons. Use Maneb, as directed, but only if you have to. Difolatan, Phaltan and Bravo are also very effective.

Probably the best preventive is also the simplest: Water in the morning rather than late in the day. Fungus likes it best when the soil is dark and damp at the same time.

Well, there you have it—a down-to-earth approach to the home vegetable garden. But before you begin, make sure there's room in the freezer for those late crops of beans, squash and other goodies. ★ ★ ★

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HINTS

FROM READERS



Pet-grooming aid

A lady's metal teasing comb, like the one shown, helps in grooming long-haired pets; it works out the undercoat that other combs seem to miss.

—Charles F. Dayton, Akron, Ohio



Parts holder

Small parts can be protected against loss and kept in proper assembly order by pressing them onto masking-tape strips fastened sticky side up to a piece of wood.

—William Swallow, Brooklyn, N.Y.



Plugging birdhouse holes

To keep less desirable birds out of a martin house before the martins' arrival, plug entrance holes with 7-oz., foam-plastic hot drinking cups.

—Charles F. Dayton, Akron, Ohio

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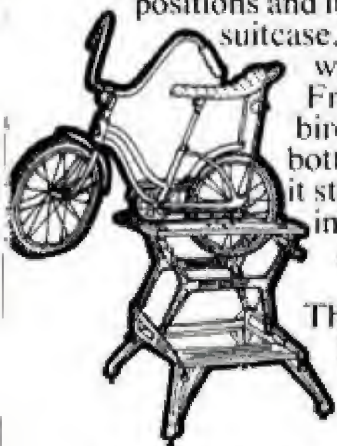
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It holds up to 350 lbs. of dead weight, it's got an incredible variety of clamping positions and it folds up to the size of a suitcase, so you can tuck it away when you're not using it.



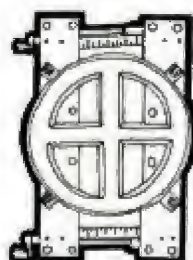
From the top of its laminated birch-ply work surface to the bottom of its sturdy steel legs, it stands practically unrivaled in ingenuity and cleverness of design.

The Vise Jaws and Clamps

The top of the Workmate is, in effect, a giant 29"-long vise. The jaws are controlled by two separate clamps that work

independently. This means

you can open one end wider than the other to hold an irregularly shaped object, like a bicycle. An extremely handy feature. (Another handy feature is the V-groove in the vise jaws, for firmly clamping pipes.)

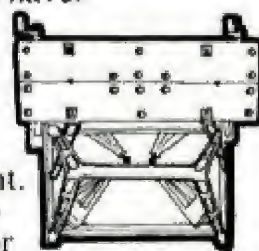


The Swivel Pegs

There are 20 holes in the Workmate's top. These holes are "stops" in which swivel pegs are placed. Because the pegs turn to grip at any angle, you get an adaptability of clamping positions most regular workbenches don't have.

The Frame

The Workmate's frame is a combination of steel and die-cast aluminum. Its skeletal quality gives it great strength, but surprising lightness in weight. It can be easily carried from job to job. The bottom legs fold in or out, giving you a choice of two working heights. And, of course, the whole frame folds up completely, for amazingly handy storage.



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GO BUILD A KITE

(Continued from page 115)

an equally airworthy version using polyethylene trash bags for sail material.

The TetraKite, by Synestructics, Inc., takes its name from its tetrahedral shape, the shape favored by Alexander Graham Bell (the same one) during his kite research. Since tetrahedrons pack together just as neatly in space as equilateral triangles do on a plane surface, a tetrahedral kite can have as many cells or lifting units as desired, each a tetrahedron with two sides covered with sail material—Bell built one with 3393 cells that lifted a man. A SuperTetraKite that's made up of four TetraKites is also available; 5½ ft. on an edge, it's too big to fit through most doors, and so requires final assembly outdoors.

From the same manufacturer, Skylinks is a kite system based on triangular box-kite modules. These can be flown separately or in train, or assembled into larger kites like the one shown on page 114, a kite designed for dual-line stunt flying.

The Red Baron is one of four airplane-style kite kits made by Straton Air Engineering. It flies with a high angle of attack, its wings acting as sails, not airfoils. The dihedral angle of the wing-sails gives stability; in

principle, it's not too dissimilar to three tetrahedral cells stacked vertically.

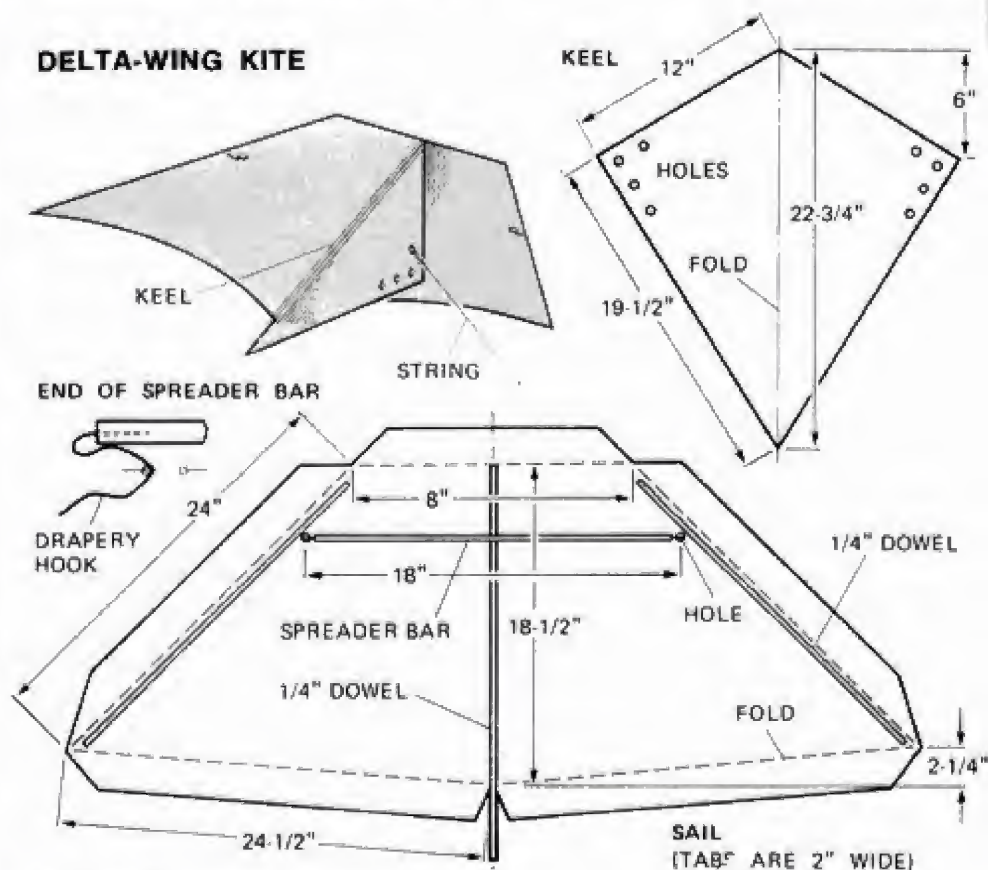
Flight tests were incomplete at press time, and the flying weather available was generally gusty. Hard landings (resulting from the attempt to fly in unreliable wind) broke a couple of the Tetra's spars. On a day with very little wind, the Red Baron proved itself a stable flyer. Its apparent fragility was no drawback, since—in a steady breeze—it was easy to fly to soft landings, both on the ground and to the hand.

The delta-wing kite is easy to build. Make a full-size pattern on newspaper or wrapping paper from the pattern below, then cut ½-mil Mylar to it. Use a razor blade for the smoothest possible edge—ragged edges tear. Fold the main-sail tabs over and glue them down with rubber cement. Attach wing spars and spine to the sail with rubber cement and strapping tape.

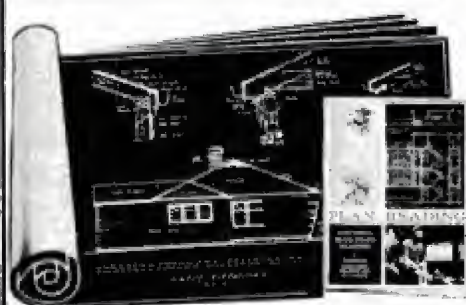
Fold the keel into a single triangle, closing its open sides with strapping tape. Attach the keel to the under side of the sail with a strip of strapping tape along either side of the long edge. Holes for the spreader bar and bridling holes get double patches of tape—with grain perpendicular—on either side of the Mylar, and eyelets for further pro-

(Please turn to page 138)

DELTA-WING KITE



Frame parts—wing spars, spine and spreader bar—of delta-wing kite are all ¼-in. dowel. Material for sail and keel is ½-mil metallized Mylar.



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GO BUILD A KITE

(Continued from page 136)

tection against rips. Putting more than one bridling hole in the keel will allow you to make adjustments for best flying characteristics. The spreader bar has drapery hooks set into dowel ends; pointed end hooks can be hammered in without splitting the dowel, but they should be secured with a dab of epoxy to be sure they won't come out.

If you are making the kite with polyethylene, use cellophane tape instead of strapping tape, skip the rubber cement and hold tabs down with tape, and omit the folded-up tap on the main sail's trailing edge.

Normally it shouldn't be necessary to run to get a kite into the air. In brisk winds, most kites will take off from your hand; if such a launch is not possible, there are two ways to go: One is to set the kite on the ground in something as close as possible to its flying position, back off about 100 ft., then when you feel a puff of wind, tug to lift off and start hauling in line as fast as you can. The other is to have a helper, about 100 ft. downwind, toss the kite gently into the air; you then haul in until the kite finds a steady breeze aloft and starts to pull. A faltering kite can often be made to resume climbing by tugging once or twice on its line; hauling in is the more drastic way to get a sinking kite back up.

Part of the skill involved in kite-flying is getting a kite to go higher and farther under less than ideal conditions. You acquire the knack by practice but it helps to use equipment giving you maximum control.

This means using a reel and rod. A good baitcasting reel works well; your thumb on the spool lets you feed line at just the right rate to a pulling kite. A rod not only gives you a place to mount the reel, making it easier to use, but provides increased leverage for line movement. Don't use a full-length rod, of course, just the bottom part of a sectional rod or a telescoping rod in closed position. Rod and reel also give much more control for landings.

Biggest book bargain on the subject is Wyatt Brummitt's *Golden Handbook Guide, Kites*, published by Golden Press at \$1.50. All the kite kits as well as the Brummitt book (\$1.70 by mail) and the Mylar used for the Delta kite, are available by mail from Go Fly A Kite Store, Inc. 1434 Third Ave., New York, N.Y. 10028. Postpaid prices are \$6 for the TetraKite, \$9.50 for Skylinks 4, \$7.50 for the Red Baron; Mylar is \$1 per yard. ★★★

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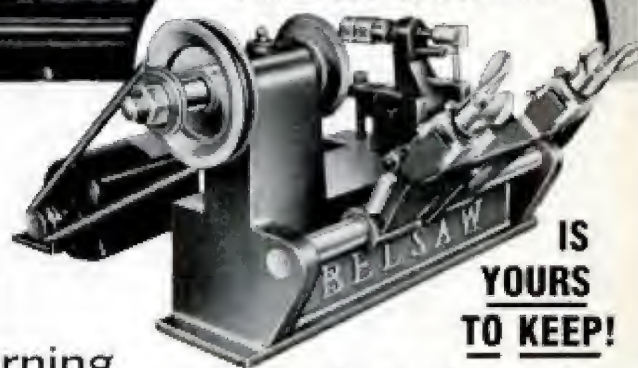
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Sun seats add style to your runabout

Build these recliners that can convert from seats to bunks, add storage below.

by Dan Dreyer

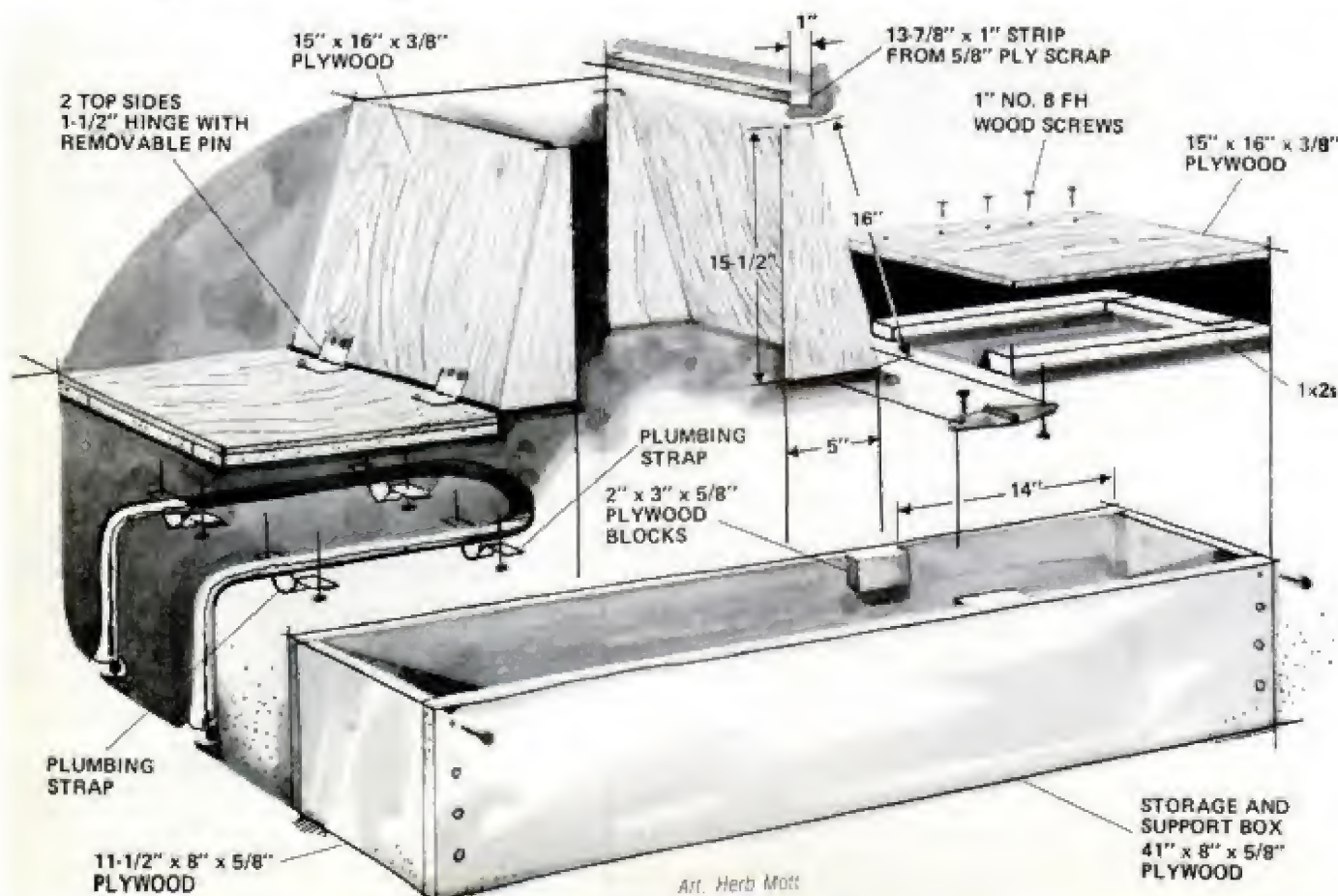


If you can find ready-made sun-lounger seats for your boat, they may cost \$150 or more per pair. You can build them for about \$25 each. Mine cost \$18.20 each, are like new after a season's use, and provide bonus storage space below that is accessible from front or back.

Naugahyde can be bought from upholstery supply, surplus and awning stores. Sometimes they have seconds

at considerable savings. Use marine plywood or painted exterior grade. Rust-free brass or aluminum hinges, screws, staples and hardware are preferred. Firm polyurethane foam is advised for seats, fiberfill sheeting or 1/2-inch foam for back. You can get 1/2-inch conduit pipe at electrical supply houses.

The 10-inch-high seats can be raised by adding to the 8-inch base;

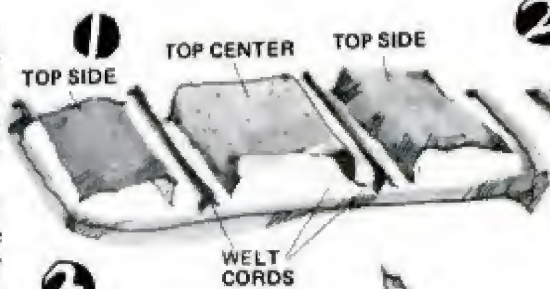


Art. Herb Mott

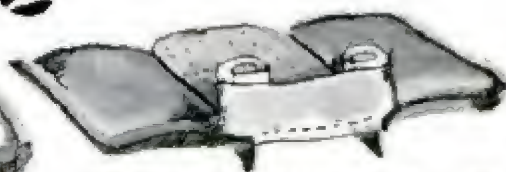
four more inches allow room for a standard metal gas tank. The storage box is glued and screwed together as shown. Seats and backs are joined with removable pin hinges, with pins replaced after upholstering.

Most sewing machines will sew several thicknesses of Naugahyde with heavy No. 16 needle and strong polyester thread. For thick sections, turn the machine by hand and pull the material through the machine. Cut material as shown and mark sew lines (usually 1 inch in) on back with a soft pencil. With zipper foot, sew welt cord or $\frac{1}{4}$ -inch rope into at least 100 inches of 3-inch stripping for bead around seat. Tape thin foam layer around edges of seat.

Cut foam in shapes shown with sabre saw, scissors or serrated knife. Assemble with foam glue or rubber cement. Turn upholstery right side out after sewing; staple edges to underside of seats, back and inside storage box base. ***



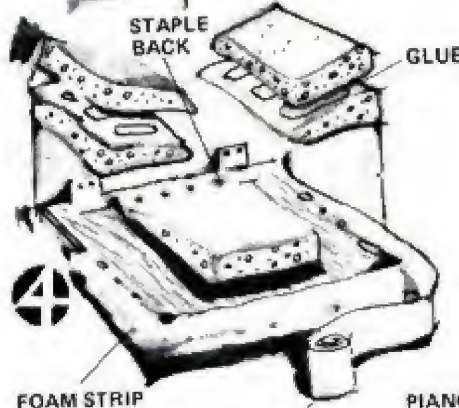
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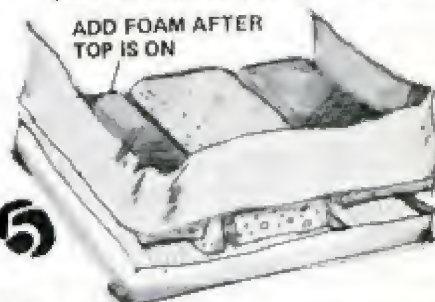
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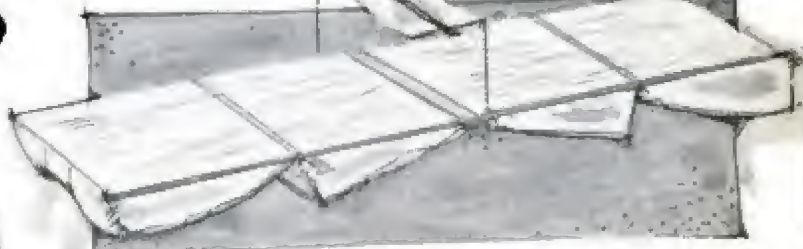
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Backrest, with $2\frac{1}{2}$ x $7\frac{1}{2}$ x $17\frac{1}{2}$ x 18-inch cover, has pocket.



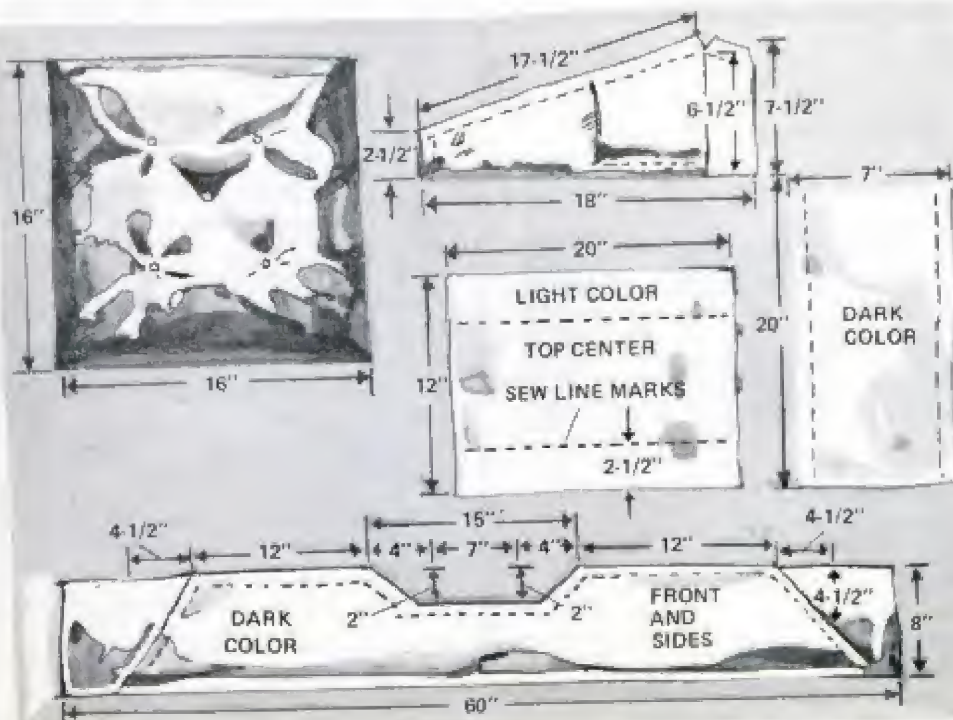
Cushion dimensions are below. Place button tufts by eye.



Plywood base of seats is connected to backs with hinges bolted to each, covered piano hinge between front and back. Front seat is hinged to base blocks; back slides aft.

MATERIALS LIST—SUN SEAT

- | Am. | Size and Description (Use) |
|---|---|
| 4 pcs. | 1x8x16" polyurethane foam (seat sides) |
| 2 pcs. | 3x4x13" polyurethane foam (cut four wedges) |
| 2 pcs. | 1x7 $\frac{1}{2}$ x 16" polyurethane foam (seat centers) |
| Darker Naugahyde, 5 yds. x 60" or 6 yds. x 45" | |
| 2 pcs. | 25x30" (back) |
| 4 pcs. | 7x20" (seat-top sides) |
| 2 pcs. | 8x50" (seat sides) |
| 1 pc. | 6x15" (piano-hinge cover) |
| 2 pcs. | 6x10" (pockets) |
| | several long 3"-wide pieces (welt) |
| Lighter Naugahyde, 3 yds. | |
| 2 pcs. | 12x20" (seat-top center) |
| 1 pc. | 15x108" (support-box cover) |
| 4 pcs. | $\frac{3}{4}$ x15x16" plywood |
| 2 pcs. | $\frac{1}{2}$ x8x41" plywood |
| 2 pcs. | 6/8x8x11 $\frac{1}{2}$ " plywood |
| 4 pcs. | $\frac{1}{4}$ x15x15 $\frac{1}{2}$ x 16" plywood, first cut 6-18x15 $\frac{1}{4}$ " in 2 pcs., then cut diagonally |
| 1 pc. | 1x2x96" framing lumber |
| 1 pc. | $\frac{1}{2}$ "-dia. x 6' electrical conduit |
| 4 | $\frac{1}{2}$ " plumbing pipe straps |
| 2 | 3" strap hinges |
| 4 | 1 $\frac{1}{2}$ " hinges with removable pins |
| 2 | 2 $\frac{1}{2}$ x12" piano hinges |
| 2 | $\frac{3}{8}$ " rubber feet (pipe) |
| 8 | $\frac{1}{2}$ " No. 8 sheet-metal screws |
| 50 | 1" No. 8 flathead wood screws |
| 32 | 6-32x $\frac{3}{4}$ " screws, lockwashers, nuts |
| Misc. | 1 lb. Dacron fiberfill, 1 can Sears polyurethane cement or 1 pint rubber cement, 1 small can waterproof wood glue, screws as needed to mount piano hinge and support box to boat. |



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HINTS

FROM READERS



Keeping paint from skinning

For skinless paint leftovers, try this oldtimers' trick: Take a deep breath, exhale into the can, then quickly close the lid. Carbon dioxide in your breath halts skin formation.—Harry J. Miller, Sarasota, Fla.



File helps in rivet removal

Removing a rivet by drilling out peened-over end can be a problem because rivet will revolve with the drill bit. What works for me is backing the rivet with a fine, flat file—being careful, of course, not to drill into it.—B. F. Borsody, Palmetto, Fla.



Ending rattle in wheel covers

After a few thousand miles, two-piece wheel covers with plastic centers can develop annoying noises at low speeds. Eliminate them permanently with a bead of silicone rubber sealant around each center on the inside, coating spring clips at all pressure points.—Parry C. Yob, Fair Oaks, Calif.

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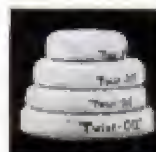
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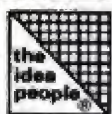


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HINTS

FROM READERS



Soldering-iron support

Spring lamp-shade clip and base from a discarded iron, bolted together, make a rest for a hot soldering iron. Threaded part of clip was just right size for hole in base plate.—*Ken Patterson, Regina, Sask.*



Cleaning aerosol valves

Even the smallest needle or pin is too big to clear the tiny port of an aerosol valve, and ordinary wire is too limp. But a bristle snapped from a common wire brush is the right size (about .015 in. dia.) and stiff enough.—*W.G. Tilsher, Rosemead, Calif.*




High-visibility house number

A lighted house number is easily made by fastening metal numerals to a piece of translucent white plastic, which is hung from cup hooks. Number on white background is lit from behind by porch light at night.—*T. J. Gray, Springfield, Mo.*

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HINTS

FROM READERS



Ice-cube tray sorter

When an assembly or disassembly job involves a number of small parts, a plastic ice-cube tray with large compartments will keep them organized. —B.W. Erwin, Kent, Ohio



Cutting dowels safely

Dowels cut "loose" on the table saw can chatter, split off or be thrown toward the operator. They're cut safely when held in a grooved block (groove slightly larger than dowel size) clamped to the miter gauge. After each pass of the saw, the cut dowel is pushed out of the block as the other end is pushed in. —William B. Eagan, Maceo, Ky.



Hand-drill level indicator

At times it is necessary to drill a hole perfectly level. A weighted shower-curtain hook on the bit will serve as an indicator. With drill running and bit level, hook will stay in one place. When bit is tilted, hook will move forward or backward. Weight keeps hook from spinning with bit. —Ken Patterson, Regina, Sask.

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I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish*! And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned*! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

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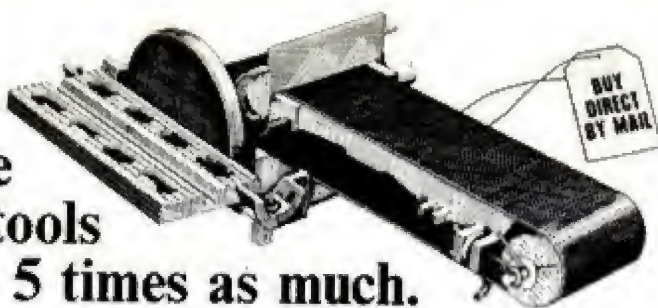
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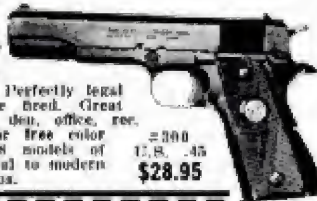
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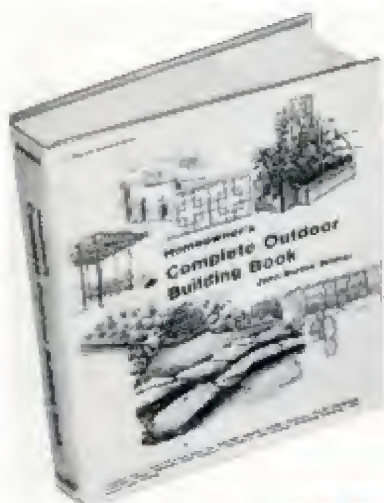
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AMPLIFIERS GROW MORE HONEST—AND MORE FINS

(Continued from page 81)

will add an extra cost to many amplifiers.

Amplifier size will go up, too, if amplifier makers choose to use more and larger fins for cooling, rather than adding fans or extra output transistors.

How much will this cost increase? Estimates differ from a low of about 10 percent to a high of more than 50 percent. But some amplifiers already incorporate the heavy, conservative construction that's necessary to pass the FTC's test—and the one 400-watter which will pass it with flying colors now is priced about one-third higher than a couple of very good 400-watters which won't.

The question is: Who's right—the manufacturers of the amps that flunk, or makers of the heavy-duty amplifiers and the FTC? If an hour of hot, one-third-power operation really corresponds to home use, then the new FTC requirement should have been imposed years ago. But if this, in fact, was a reality, then, the amplifiers that flunk the FTC test would have been flunking out in home use, too. Their protective

circuits would have switched them on and off as heat overloads occurred.

Of the manufacturers and engineers PM polled for this article, only one could recall a case of an amplifier coming back to his factory because it cycled on and off that way—"and that was an amp whose bias had been misadjusted."

Dynaco points out that though they offer an optional fan for extra cooling, very few users have felt the need to order one. And, says Dyna's Bob Tucker, some amplifier makers are moving their protective heat sensors farther from the output transistors to delay shutdown—which improves their amp's ability to pass the test, but also reduces somewhat the sensors' margin of protection against damage to the amplifier.

Yet only one manufacturer could even conceive of a home user running his amplifier at its least efficient, hottest power point: "Under normal conditions in a well-designed system, an amp usually delivers 10 percent of its power. But when a nut takes inefficient speakers, turns the bass up, and turns the volume up to clip-

ping, he drives the amp to about 40 percent power."

So maybe the makers of at least some amplifiers that won't pass the preconditioning test are right. That means the FTC is wrong—but not the makers whose high-power amplifiers will pass. There's nothing wrong with buying a more robust amplifier than you need, so long as you're willing to pay the extra price for it. But buying a battleship instead of a powerboat of equal speed should be *your* choice—not one that's foisted on you.

Not that a "battleship" amplifier is an entirely unjustified expense. As BGW's Brian Wachner points out, the smaller the temperature increase between room temperature and the operating temperature of an

How to uprate a 15-watt amplifier—the old, now illegal, way

1. Start with a stereo amplifier delivering, per channel, at 1-percent distortion, 15 watts.
2. Double it for total power of both channels: 30 watts.
3. For "music power," add 30 percent.
4. For EIA ratings (at an implicit 5-percent distortion), add 20 percent.*
5. For maximum power at unlistenable distortion levels, add about 35 percent.*
6. For " ± 1 db," add 25 percent.
7. For "peak" power, add 100 percent.
8. For "Maximum IPP (Instantaneous Peak Power) watts ± 1 db" power, add all the above (except No. 4) to get: 132 watts.

*Exact values will vary from one amplifier design to another.

amplifier's output transistors, the longer those transistors will last; each 10° reduction roughly doubles their lives. But other sources say other factors cause the major limits to transistor life.

Even Wachner agrees that the one-third power test "wasn't the greatest thing to pick." But he feels that, had he written the standard, he would have included "some test of amplifier thermal capacity; thermal design has lagged behind circuit design, so far. In our amplifiers, we think every 2° or 3° is worth fighting for."

Power ratings into 4-ohm loads can cause another problem under the new FTC rule. Transistor amplifiers mostly deliver more power into 4-ohm loads than into 8 ohms, and more still into 2-ohm loads. But since more power means more heat, even an amplifier or receiver that could run cheerfully forever at one-third its 8-ohm power might sizzle at one-third of its higher, 4-ohm power potential.

From the standpoint of amplifier makers, the simplest solution would be not to list a 4-ohm power rating:

"We don't rate power at 4 ohms," says Radio Shack engineer Frank Roberts, "because we don't sell any 4-ohm speakers."

But though the rule, as written, is ambiguous, there are rumors the FTC will insist on 4-ohm ratings, too. Even though most speakers are 8-ohm models, there are a lot of 4-ohm models. And even 8-ohm speakers will present a 4-ohm load if you run one main and one remote speaker in parallel.

It's also possible simply to claim less power at 4 ohms than the amplifier can actually deliver, and precondition at one-third of this lower level. "Ironically, though," adds Don Merryman, an engineer at H. H. Scott, "our amps deliver as much power at 4 ohms as they ever did, under music listening conditions—more power, in fact, than they do at 8 ohms. Only now we can't say so."

If power at 4 ohms is understated, or unstated (which could lead buyers to assume it's the same as at 8 ohms), the hi-fi buyer with 4-ohm speakers can get more than he bargained for.

That's not entirely an advantage. Dynaco's Bob Tucker points out: "If the FTC rule forces amp manufacturers to, in effect, underrate 4-ohm power, you could buy an amplifier rated well under your speakers' maximum rated power-handling capacity and then blow out your speakers anyway with the power you didn't know was there."

"And if manufacturers stop stating 4-ohm power at all, speaker makers might conceivably list their 4-ohm speakers as 8-ohm models (the impedance of a speaker rated at 4 ohms is 8 ohms or higher at some frequencies, and maybe 3 ohms or less at others, so the rating is more or less nominal). That means a consumer could wire up two, or even three, '8-ohm' speakers in parallel and have the amp go crazy looking at a load that could be less than 2 ohms at some frequencies."

What is the hi-fi industry doing about the new FTC rule? Some, chiefly Phase Linear, Dynaco and *Stereo Review* magazine, are protesting it. Others, chiefly those who bring out new models each year anyway, are welcoming it. Still others aren't paying it much attention, either because their products have no problems with the rule or because they haven't yet grasped the fact that they have a problem.

As one maker of low-priced equipment stated candidly, "I don't think the FTC intends to enforce the rule literally. They're reasonable people. But if they did, we'd definitely have to change our designs." ★★★



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SERVE YOUR GUESTS WITH A DASH OF ELEGANCE

(Continued from page 91)

of two facing legs and draw a line across the tops. Do the same with the other two legs. Now tilt your drill-press table to correspond with the cross lines on the legs, and drill a series of $\frac{3}{8}$ -in. holes $\frac{3}{4}$ in. deep in one pair of legs. Do this for the others, tilting the table the other way.

To build the top, you'll have to edge-glue several boards and join them with dowels. Each butler-table hinge has a single-thickness leaf and a double-thickness one. It's standard to rout both mortises to suit the thicker leaf, then shim under the thin leaf. A bevel will have to be hand-chiseled at the outer edge of each mortise for hinge clearance.

If your router has a 5-in.-dia. base (most do), you can make your plywood hinge-mortising template the size given; if not, cut it to suit. Use the template's centerlines to position it over the hinge locations and place cardboard between the top and tray leaf for clearance. Then hold template, plus top and leaf, with C-clamps. The eight hinges can be purchased from Armor Co., Box 290, Deer Park, New York 11729, for \$16 postpaid. ★★★



Edges of built-in tray handles are rounded with router after forming curved openings with a $\frac{3}{8}$ -in. drill bit and sabre saw.

Cleats on underside of the tabletop fit inside aprons to register top automatically with the base when placed in position.



KEEP DRINKING WATER SAFE

(Continued from page 110)

laboratory to make a pathogenic survey, which can be done cheaply by your local public health department.

5. The laboratory should be supervised by a graduate chemist.

Once you have selected a laboratory, you will be told how to draw water samples properly for testing. Some laboratories don't leave this critical task to homeowners, but will send out experts to assure that the samples are not accidentally contaminated in the process.

If the lab report comes back indicating you have a problem, the first thing to do is study the type or types of contamination present, then pick the proper water-purification equipment suited to the condition. Don't be fooled by gadgets billed as "purifiers" that, in fact, are merely intended to remove certain minerals that make water "hard." Dangerous pollutants need specialized treatment. Inorganic and some organic chemicals can be removed by reverse osmosis. Organic substances can be eliminated by carbon filtration. Harmful bacteria (pathogens) can be killed by chemical or ultraviolet disinfecting. You may need

one, two or all three of these depending on the condition of your water.

A reverse-osmosis purifier uses a thin plastic semipermeable membrane resembling ordinary plastic wrap. The membrane is wound spirally around a central core and rejects dissolved inorganic substances and organic matter, while allowing purified water to pass through. Water entering the purifier receives a prefiltering through porous cellulose to remove turbidity and solid suspended matter that might clog the reverse-osmosis membrane. It also passes through a final filter of carbon after flowing through the membrane.

Such a reverse-osmosis unit is connected into the household water supply and uses normal water pressure to force the water through the membrane. Impurities trapped by the various filters drain into the home's sewage system, while purified water flows into a storage reservoir ready for use. A small home-type reverse-osmosis unit provides three to five gallons of purified water a day—enough for drinking and cooking. Your regular water supply is used for bathing, toilet-flushing and other nonconsumptive functions.

Where only toxic organic pollu-

nants are present, an activated carbon filter can be used. The carbon works by adsorption—dissolved impurities (or gas or odors) adhere to its pores, allowing purified water to pass through. Besides removing harmful organic contamination, a carbon filter is also excellent for eliminating hydrogen sulfide (so-called sulfur water that emits a rotten-egg smell), chlorine and other nontoxic matter that gives water an unpleasant taste or odor, but is not necessarily dangerous.

In time, the pores in a carbon filter clog up and can no longer adsorb impurities. When this happens, the element must be discarded and replaced with fresh carbon, usually once a year. To prolong the life of a carbon filter and keep it functioning efficiently, modern filter tanks are equipped with timing devices that provide automatic backwashing. During backwashing, water is forced through the carbon bed in reverse direction to flush accumulated waste matter down the drain. Normally, backwashing is set to occur once a week for about an hour. Without backwashing, a carbon filter would fail long before its usual one-year life expectancy, so be sure to look for

(Please turn to page 148)

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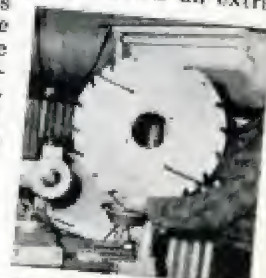
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KEEP DRINKING WATER SAFE

(Continued from page 146)

this feature when purchasing a unit. Be sure, too, that the unit you buy is specifically designed to remove *toxic* pollutants—not just odors and bad taste, as some simple filters do. Reliable makers of filters—both the carbon and reverse-osmosis kind—will gladly specify exactly what impurities their units will eliminate, so check on this when deciding which type you need or whether a particular model will satisfy your requirements.

Bacteriological pollutants cannot be filtered out of water—they must be killed before they reach the tap with disinfecting chemicals or ultraviolet light. Chemical treatment is the oldest and most common method. The agent used is usually chlorine, but iodine, bromine, potassium permanganate and other chemicals may also be employed. The chemical in solution form is fed into the water supply by automatic pumps programmed to inject just the right amount to destroy pathogens.

While the method is effective, chemical disinfecting has some

drawbacks. The chemical must be carefully monitored to make certain excess amounts do not get into the water as it could then become poisonous itself. Also, there is some suspicion in medical circles that chemical disinfecting can have a long-range adverse effect on health, even in small quantities. Finally, the chemicals used can give water a bad taste.

The more modern ultraviolet light method avoids these problems. Ultraviolet germicidal lamps are available in cylindrical units with standard plumbing fittings at the ends. The cylinder is simply cut into the water intake line. As water flows through it, the ultraviolet light kills any pathogens it may contain. Such units have their own disadvantages, however. One is cost. Each fixture sells for about \$200 and unfortunately must be replaced approximately once

Bacteriological pollutants cannot be filtered out of water—they must be killed before they reach the tap . . .

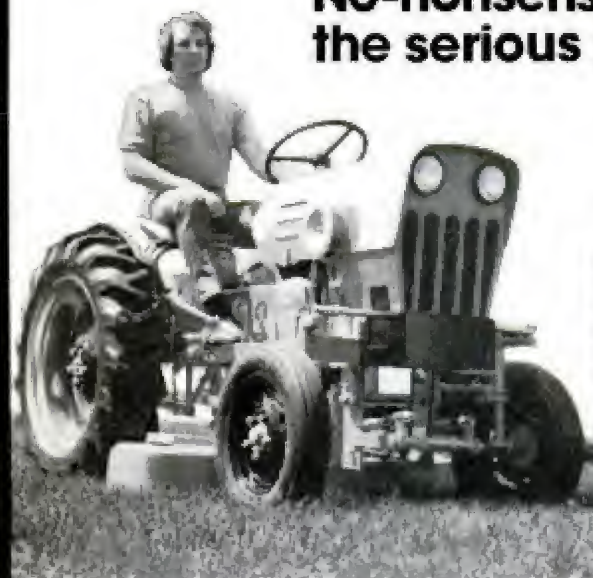
a year at the same cost. In addition, such units are not effective if your water is turbid or contains iron salts as the light rays can't penetrate the particles to kill the pathogens. This means your checking should include tests for iron salts and turbidity if you decide on using ultraviolet disinfecting. If either cost or your water condition rules out the ultraviolet method, you can always fall back on chemical treatment.

One caution: Home water-purification systems are designed primarily to combat *mild* and *nonlethal* forms of contamination. If you find your water supply seriously polluted, such as with sewage, don't fool around with home remedies. Report the condition immediately to your local health department (if they made the original survey, they will, of course, know about it already and presumably will take action). In any case, be sure that action is taken to correct the condition at its source—not in your home. If your water is polluted, your neighbors' may well be, too, especially if they draw from the same or similar source as you. Raw sewage seeping into a water supply is too deadly to take chances with and must be stopped before it reaches your home.

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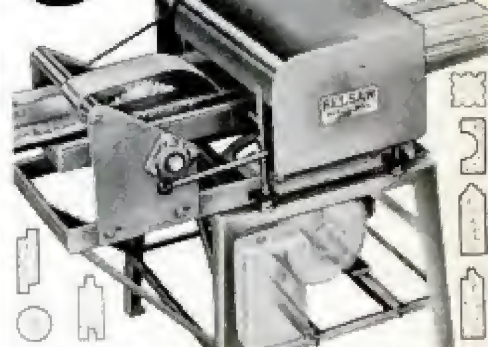
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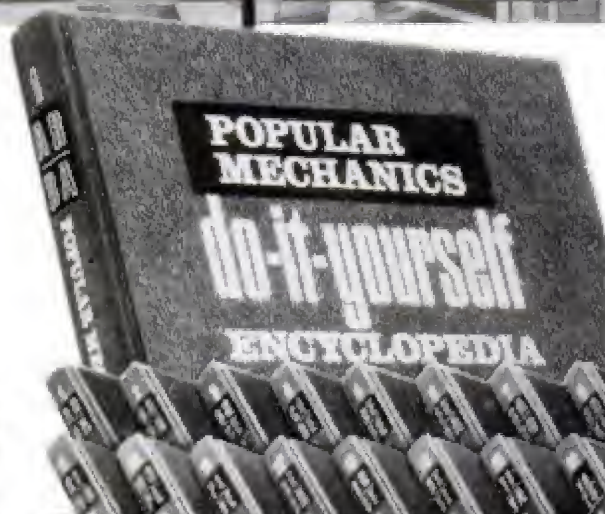
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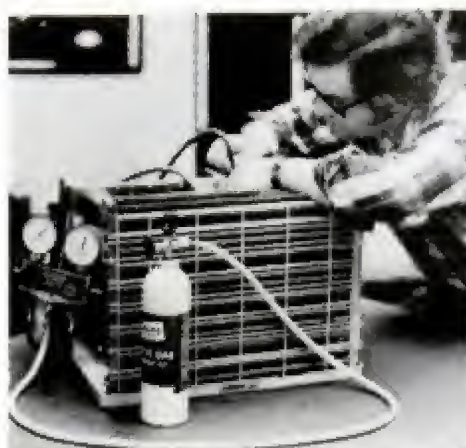
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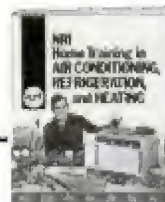
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EXOTIC, SUPERLIGHT BIKES

(Continued from page 107)

cyclist, anything that wins races worth the investment.

The three unique bikes are a Teledyne Titan titanium frame machine, a Mossberg graphite fiber frame bike and a Monark-Crescent stainless-steel frame road bike.

The Teledyne and Mossberg frame sets can be made up into an 11-pound track bike, an 18-pound road racer or a 20-pound touring machine. At the moment, I prefer the Teledyne because I have put a couple thousand miles on it. Soon as I road-test the Mossberg I'll report how it rides.

Teledyne's frames weigh 3 pounds in the 21-inch size, 3.9 pounds in the 24-inch size. This bike's short wheelbase of only 39.5 inches gave me a very quick-responding ride, which took some getting used to. At first I thought, too, that this light bike would be unstable. Not so. I tracked as surefootedly on fast downhill runs over rough roads as it did glued to a smooth road on turns.

Teledyne frames are in 21, 22, 23 and 24-inch sizes, with the same 39.5-inch wheelbase in all sizes held by varying the frame angles. The 21-inch frame has 74°/30°/30°; the 22 and 23-inch frames have angle of 75°/30°/74° and the 24-inch frame has angles of 74°/30°/75°. These rather severe frame angles coupled with the short wheelbase gave me a fairly stiff ride for a touring bike. But when I shifted from high to low flanged hubs with crossed four spokes (longer spokes mean a more flexible wheel) and a well-broken-in 50,000-mile Brooks Pro leather saddle, most of the road shock disappeared. I found the 20-pound Teledyne Titan far easier up hills than my old 26-pound touring bike.

Titanium is extremely corrosion resistant, and the hard anodized finish of the Teledyne frame stays cleaner. The frame only, with fork and headset, sell for around \$450 through bike shops. If you use good components, you can come up with a complete bike for about \$900.

Mossberg has made a real breakthrough with its unique graphite fiber tubing frame. This frame, with a 100,000-p.s.i. tensile strength, is stronger than the titanium or conventional Reynolds "531" manganese molybdenum frames at 80,000-p.s.i. yield strength. However, you will never come close to breaking the titanium or "531" tubes unless you run into a truck. Replacing a graphite tube could be a problem, though.

Mossberg furnishes graphite fiber frame sets with a very short-rak-

(Please turn to page 154)

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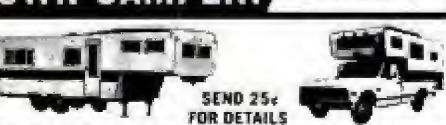
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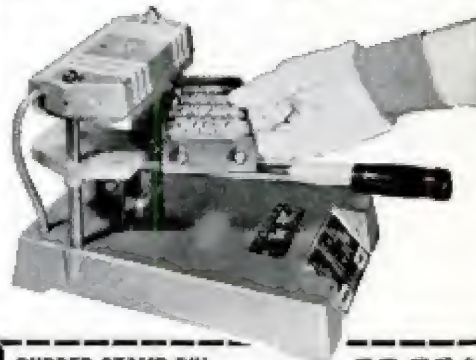
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EXOTIC SUPERLIGHT BIKES

(Continued from page 152)

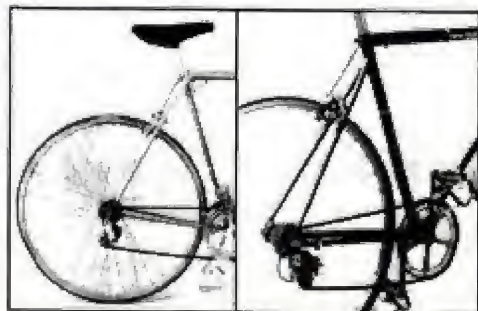
steel fork which in my opinion would give a ride too stiff for comfortable touring, though okay for racing. The firm says you can order the frame without a fork. If so, I'd ask for at least \$75 off the frame list price of \$600, and use a Reynolds "531" fork with 2 3/8-inch rake.

Frame tubes are joined into special steel lugs with an "aircraft" adhesive. Complete bike is \$1200 for the road and \$1300 for track. Frame sizes are 20, 22 and 24 inches. Frame weight is 3.1 pounds for the 20-inch frame. Frame finish is hard, very scratch and corrosion-resistant. Double seat stays add strength, rigidity.

A stainless-steel bicycle, not as lightweight as the Teledyne or Mossberg bikes, is made in Sweden by Monark-Crescent. I saw this bike frame being hand-silverbraided last year and was impressed with the accuracy of alignment and craftsmanship. The 21-inch frame weighs only 22 pounds, light for a touring bike of more or less conventional design. Frame sizes are 21, 22, 23, 24 and 25 inches, which should fit 95 percent of us. I like this bike. It will never rust or need refinishing; it has the finest of component parts. Frame material is 302 or similar austenitic stainless steel with a yield point of around 40,000 p.s.i. Sweden's professional bike-racing team has won important European races on M-C stainless-steel bikes. You can buy this complete bike for around \$650 from U.S. dealers. ★ ★ ★



Extra tube in Mossberg graphite fiber frame runs from top tube to rear stay lug.



Crescent (left) has conventional frame angles; Teledyne, extreme rear stay angle.

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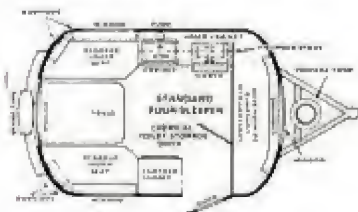
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(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

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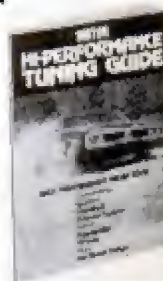
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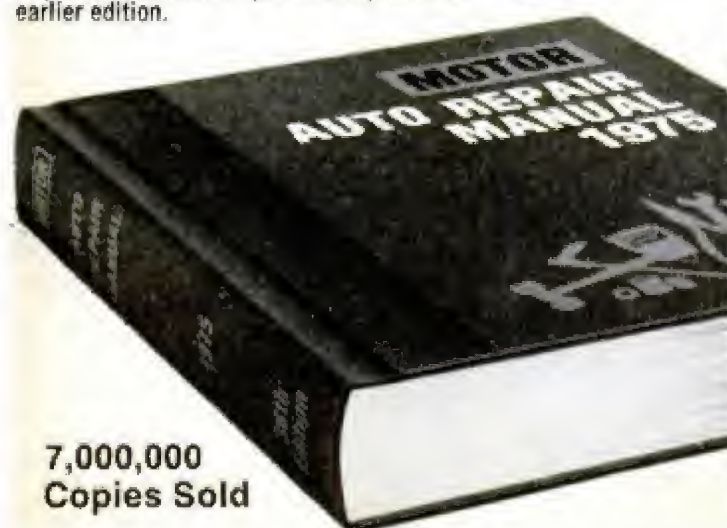


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